SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1893, by Munn & Co.

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXIX.—No. 3. ESTABLISHED 1845.] NEW YORK, JULY 15, 1893. [$3.00 A YEAR. WEEKLY.

THE KRUPP EXHIBIT AT THE GREAT FAIR.

Of all the foreign nations that are taking part in the World's Columbian Exposition at Chicago, Germany takes the lead, in extent, variety, cost and superiority in almost every characteristic. Of the private exhibitors, whether foreign or American, Krupp, the great metal manufacturer of Germany, stands at the head. His exhibit is wonderful, and by its greatness almost dwarfs all other exhibits in the same lines. The expenses and value of this exhibit are said to have reached $1,500,000. So large is the Krupp display that a special building became necessary, of which we here present a photographic view, specially taken for the SCIENTIFIC AMERICAN. The Krupp building is located just south of the great landing pier. The building is 200 ft. long, 82 ft. wide, 43 ft. high. It fronts on the lake and stands near the terminal loop of the intra-mural railway.

On this page we give a view of one of the many great things to be seen in the Krupp building, namely, one of the Krupp traveling cranes, used for slinging and moving the great Krupp guns. The massive proportions and great strength of this machine, as well as its graceful proportions and useful finish, will be evident at a glance at our engraving.

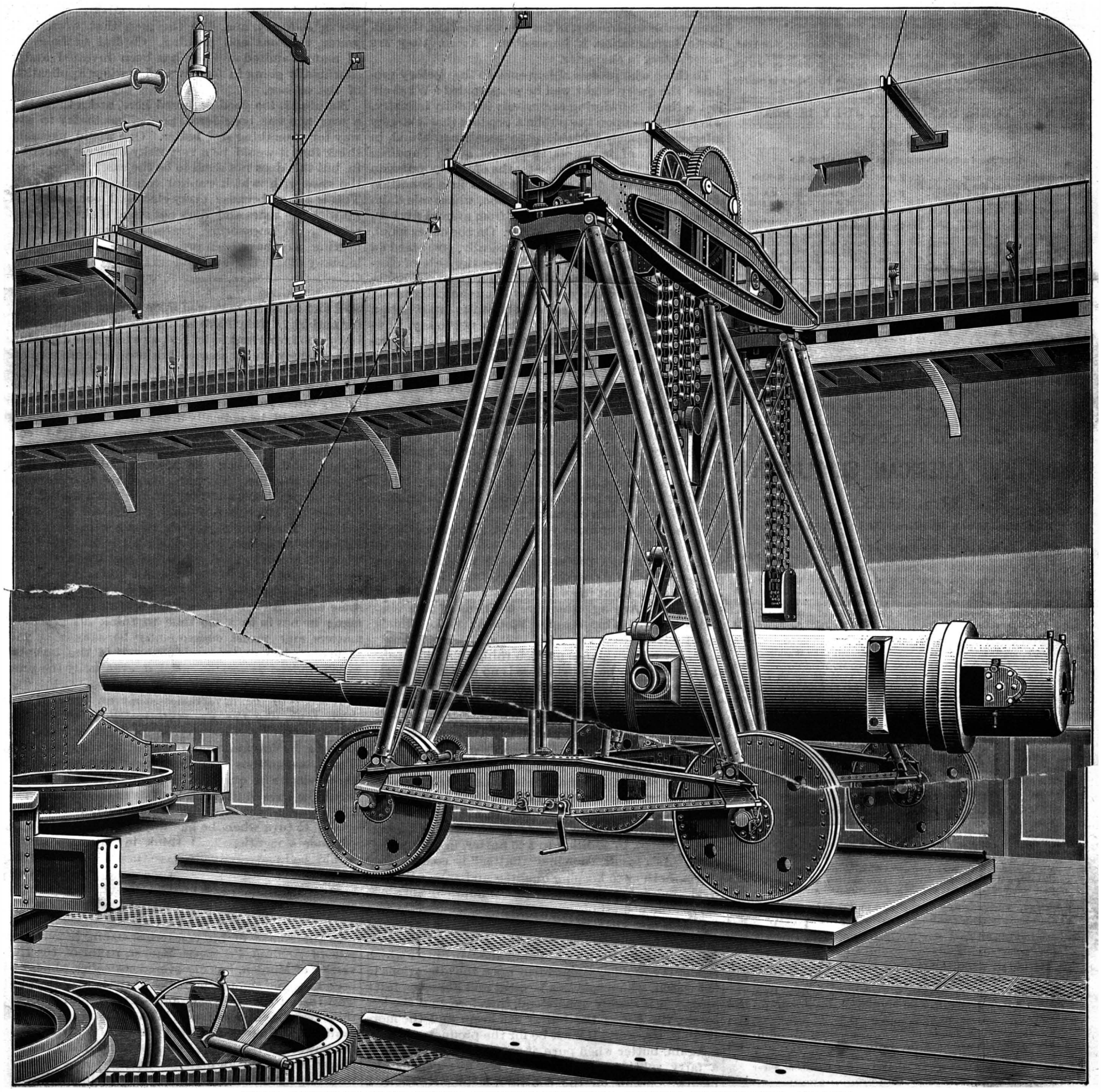
A very comprehensive description was recently given in *Engineering* of some of the principal Krupp exhibits, and we cannot do better than present extracts therefrom, which follow. First, as relating to the great guns for which the Krupp establishment is now so famous. One of them is shown in our engravings.

The largest weapon shown, and it is the heaviest piece of ordnance ever brought to an exhibition, is a 16·24 in. coast defense gun; the total length is 33·5 calibers, or 45 ft. 11 in., the length of bore being 41 ft. 8 in.; the total weight is nearly 123 tons.

This gun has fired sixteen rounds at the Krupp testing grounds at Meppen. During these trials the following results were obtained: The projectile weighed 2,200 lb., and the charge was 902 lb. of brown prismatic powder; an initial velocity of 1,981 ft. per second was recorded, and the striking energy was 18,594 metric tons. We give a photographic view of the firing of this extraordinary weapon.

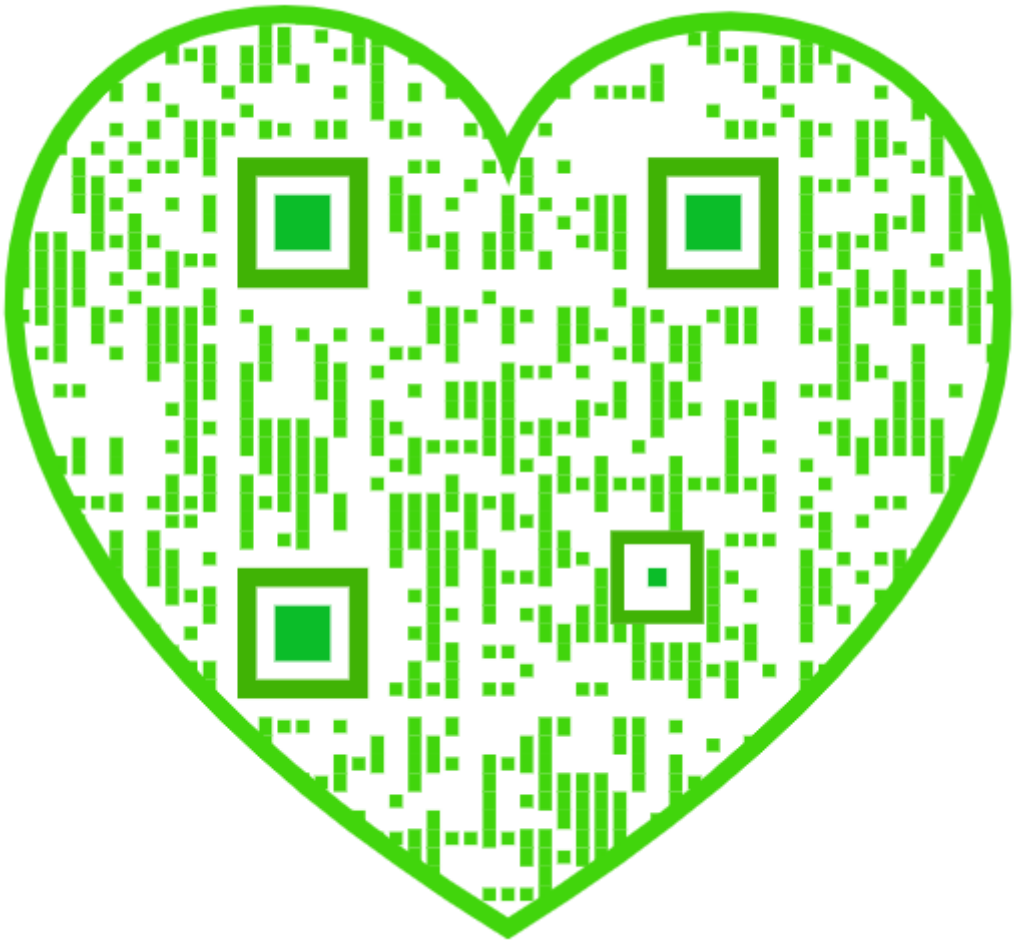
The cost and trouble involved in the transport of this gun from Essen to Chicago must have been enormous. The gun was landed at the Sparrow Point works of the Maryland Steel Works near Baltimore. For the long journey from Baltimore to Chicago a railway truck was specially prepared by the Pennsylvania Railway Company. This truck forms one of the exhibits of the railway. The total weight of the car, which is carried on thirty-two wheels, is 175,000 lb., or

(*Continued on page 40.*)



THE WORLD'S COLUMBIAN EXPOSITION—THE KRUPP TRAVELING CRANE.

© 1893 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *eight dollars and fifty cents a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JULY 15, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural devices, new..... 41
Animals, Kansas, at the Fair*.... 41
Antelopes, buffalo, and prong-horn*..... 41
Architect Hunt Royal Institute medal for..... 43
Arctic expedition, Peary's new*.. 43
Atmosphere, the high..... 43
Bearings, compressed air, to cool 39
Book, the oldest in the world..... 42
Bottles in China..... 42
Bridge, cement and iron..... 37
Butter, artificial..... 34
Calculator, a lightning..... 42
Car coupling, Ervin's*..... 37
Chimney cleaner, Bliss'*..... 37
Colorado River dam, the..... 42
Columbian Exposition, Kansas natural history exhibit*..... 41
Columbus, silver statue of, Bartholdi's*..... 37
Cosmetics, ancient Egyptian..... 34
Cough, glycerine for a..... 37
Cutter, fin, Leni Lenepe*..... 43
Eggs, shapes of..... 39
Electrical inventions, developing 34
Electrical inventions new..... 44
Elk, a family of*..... 41
Exposition notes..... 35
Exposition, Columbian—British building*..... 36
Exposition, Columbian—Krupp traveling crane and great gun*33
Exposition, Palace of Fisheries at the*..... 35
Foundation laying, novel..... 42
Goats, group of Rocky Mountain* 41
Guns, Krupp, at the Exposition*. 40
Incandescent lamp bulbs, blackening of..... 37
Inventions, recently patented.... 44
Ivorytypes*..... 43
Labor, Chinese, cheap..... 42
Lithography, discovery of..... 42
Magnetism and the human body.. 38
Malaria..... 43
Moose, family of, a combat*..... 41
Moth, the gypsy, fighting..... 38
Paper, a new prepared..... 38
Patents, the History of..... 39
Peary's expedition, the Falcon*. 43
Power transmission, long distance..... 38
Railway appliances, some new.... 44
Scald the scoundrels..... 39
Soapsuds as a lubricator..... 39
Tibetans, family life among the.. 38
Victoria House, the, Chicago*.... 36

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 915.

For the Week Ending July 15, 1893.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CIVIL ENGINEERING.—The Canal Connecting the North Sea with the Baltic Sea.—Four large illustrations of the floating elevators..... 14615
The Swinging Bridge of Tarento.—1 engraving..... 14618
Pneumatic Conveyor Plant.—Full illustrations of machinery, made by Messrs. Samuelson & Co., Banbury, England..... 14618

II. CHEMISTRY.—Neutral Fat in Mineral Oil.—By Dr. J. KLIMONT.. 14628
Some Products of Cassava.—A paper read before the Washington Chemical Society by E. E. ELWELL and H. W. WILEY..... 14628
On the Influence of the Average Annual Temperature on the Chemical Composition of Sugar Cane.—By GUSTAVE MICHAUD... 14629
The Chemistry and Physiology of Foliage Leaves..... 14630
Oils of Apricots, Cherries, Plums, and Peaches as Adulterants of Almond Oil.—By C. MICKO..... 14630

III. HYGIENE.—Lemons in Summer..... 14626

IV. MECHANICAL ENGINEERING.—Nau's Method of Making Metal Plates.—By JOHN B. NAU..... 14623
Hargrave's Flying Machine.—Full description with 3 illustrations of this interesting machine..... 14618

V. MISCELLANEOUS.—A Portrait of Columbus Attributed to Titian.—1 illustration..... 14622
The "Sap" of Trees and its Movements.—By CHARLES R. BARNES, Prof. of Botany, University of Wisconsin..... 14624
Extremes in the Vegetable Kingdom.—By G. C. NEALLEY..... 14625
Dandelions as Weeds..... 14625
California Raisin Grapes..... 14625
Pine Needles.—By J. BERTRAM and H. WALBAUM..... 14627

VI. NAVAL ENGINEERING.—The New Battle Ship Massachusetts.—Full description with 5 illustrations..... 14619

VII. PHOTOGRAPHY.—A New Tele-Photo Lens..... 14622
Metol..... 14622

VIII. PHYSICAL GEOGRAPHY.—The Formation and Deformation of Minnesota Lakes.—By C. W. HALL..... 14625

IX. SURGERY.—How to Bandage a Finger.—By S. GEO. HERMANCE, M.D., Rochester, N. Y.—3 illustrations..... 14626

X. TECHNOLOGY.—Silicious Fire Bricks..... 14621
Transparent Toilet Soaps..... 14621
Enameling Papers..... 14621
Effects of Sulphur on Clarification.—By Prof. J. T. CRAWLEY.—A paper read before the regular meeting of the Louisiana Sugar Chemists' Association..... 14627
Skeletons of Man and Horse.—1 engraving.—Comparative osteology..... 14626

ARTIFICIAL BUTTER AND BUTTER SWINDLES.

With the introduction of artificial butter, oleomargarine, "butterine," etc., was instituted a rivalry—or rather a jealousy—on the part of the farming community, who feared the utter abolition of a market for their product. This fear has by no means been fulfilled. However, farming interests were able to secure legislation of an exclusive character, whereby artificial products resembling or imitating butter are obliged to be branded and labeled; and furthermore, a tax was laid thereupon which, of itself, was intended to be prohibitory.

Not satisfied with this, in some States it is even demanded that hotels, restaurants, and public institutions using artificial butter, oleomargarine, "butterine," etc., shall conspicuously place large placards announcing the fact in their dining rooms. That the law, both as to sale and advertising, is in many instances evaded must be evident. Thus these prohibitory laws work injuries to large and beneficial manufacturing interests; but, at the same time, it must be admitted that these very restrictions have, in no inconsiderable measure, contributed to the improvement and perfection of this class of products. It is a fact that, at the present moment, so-called "butterine," or oleomargarine, can be bought on the market, which, while representing in exact chemical constituents the products of the dairy, is, at the same time, much cleaner and purer and more uniform as to quality. Artificial butters have come to stay. Already they are found on the tables of the wealthier and better classes. It is notorious that manufacturers of these products prefer them to the best butters, whether of dairy or creamery production. Moreover, artificial butters possess one insuperable superiority, in that decomposition, through lactic fermentation, is impossible. Again, they are never *salvey* in character.

To those who profess abhorrence to the factory products, the query might well be propounded: What object is there in fostering exclusively the dairy industry, when it forces upon the public a product that is largely inferior, extremely variable as to constituents, and, in the majority of instances, suspicious as to handling and making? So far as nine-tenths of the population is concerned, the butter purchased is in a condition closely bordering upon decomposition, whose sole claim to superiority is that it is derived from animal sources, through the medium of the udder. On the other hand, precisely the same product chemically, combined in the same precise proportions, under the title of oleomargarine, "butterine," artificial butter, etc., is obtained from the same source by a method absolutely cleanly and unobjectionable, without the intervention of the secreting apparatus. This is not to say, however, that there are no inferior oleomargarines, the result of working up waste, or an admixture of other fats than those of beef, and that are sold at low prices; the purchase of these, of course, is optional, and measured by the pocketbook of the purchaser.

It is also a notorious fact that the farming community, alive to the cheapness of the products simulating those of the dairy, purchase the inferior grades in large quantities *and mix with butter*, which they return to the market as the latter product solely. Two-thirds of the dairy product marketed in the large cities of the West is of this character.

Again, for two or more years past, a large portion of the United States, and likewise of Canada, has been invaded with agents professing to sell a chemical composition which will not alone increase the yield of butter from cream, but likewise precipitate the same from skim milk. Among other preparations of this class sold is one which has invaded Michigan, Ohio, Illinois, and Indiana, termed "*black pepsin.*" It is simply necessary to say there is no such thing as black pepsin; and further, may be added, there is no pepsin whatever in the compound. This, as hawked about at the extraordinary price of $2 per ounce, possesses an absolute value of less than three cents, it being simply a preparation of salt, and annatto, with a small quantity of rennet added. A mere tyro in chemistry will readily recognize that this does not increase the product of butter pure and simple, but that the increased yield obtained from the milk is due to a fat that should be entirely foreign to the dairy. In other words, this so-called "butter-increasing compound" precipitates an average of 3·64 casein, in addition to 3·55 butter, in 100 parts of milk. As a result, the final "butter" is considerably worse, both as to keeping qualities and as an article of food—judging from a standpoint of nourishment alone—than the poorest oleomargarine.

It is a fact that butter contains a small portion of casein, which is taken from the milk; but the best butter contains the least. The changes in butter which render it *rancid* are dependent upon the alterations in the casein, which acts as a ferment and liberates fatty acids. It is readily understood, therefore, that the less casein, the better the butter will keep; and the more there is, the worse it must be for the product.

Again, butter when pure, it must be remembered, is a fatty substance, made up of non-nitrogenous elements. Casein, on the contrary, is almost wholly a nitrogen-producing compound. It might be mentioned here that while butter *absolutely* free from casein is a comparative rarity, so also cheese that is *absolutely* free from butter is equally as rare. Cheese *per se* is composed almost wholly of casein, and a compound very difficult of digestion. Butter, on the contrary, if pure, should be assimilated with the greatest ease.

An analysis of so-called *black pepsin* reveals:

Salt	0·83+
Annatto	0·15
Rennet (nearly)	0·02

This, however, is not the only compound of the kind sold for the specific purpose mentioned. There is also hawked about a liquid which, on investigation, proves to be a very weak solution of a poor quality of muriatic acid. It would seem, under the circumstances, if prohibitory laws are to be enforced against artificial butter, products that are merely adulterated butter, or that purport to increase butter by commingling with it the casein matters of the milk, should also be made subject to severe inspection and legislation.

Developing Electrical Inventions.

The industry of the world, whether mechanical, electrical or chemical, is based on the invention of some inventor, and may be very old or very young, as the case may be, but the great fact is nevertheless the same. The extraordinary developments that have within very few years taken place in electricity have shown the world what an inventor can do when his genius is used in the right direction and backed up with a good technical education. There is hardly any one that requires such a thorough scientific training as our electrical engineer of to-day, and this fact is recognized more and more as time advances. It is a young industry, and, like the men that work in it, young, vigorous and pushing. Capital to the extent of many hundred millions has been invested and is continually going in for new and various applications of the science.

Nothing is too good or sacred here, and a thing that a year ago was considered perfect has to-day to give way for something still better. One would naturally think that it would be a very risky business to engage in, but this does not seem to be the case, judging from the ease with which capital can be secured for it. This is a fact, because every electrical concern keeps up with the times and does not stand still. Problems relating to measuring, transforming, transmitting, heating, etc., have been presented and quickly solved in many different ways and so far very satisfactorily. Once, now and then, the inventor comes across a stubborn and intricate question, and it looks as if all the skill and patience bestowed upon it were thrown away for nothing. They have to be solved, nevertheless, it being too important to let rest, as every new departure means honor and increased business to those who are working on it.

In this category we have to class production of electricity direct; an economical way of storing it, which probably will be radically di erent from the present way; electric traction without any overhead construction, and a more reliable lamp, with the same or higher efficiency than the present makes for out of door illumination. They are very hard to solve, some of these problems, and they require both capital and intelligient labor if anything good shall be accomplished. There are capitalists willing to invest money in just those things, but how shall the inventor know where they are? That is another problem, and sometimes almost as hard to solve as a difficult electrical one. This obstacle ought to be done away with in some way. An engineer is very seldom also a business man; he has in fact no time to think about money matters, and must consequently be associated with some one who understands that part of the business, which, indeed is very essential, if eventually the problem is successfully solved.

It seems to me, nevertheless, that an institution of high rank, like the Franklin Institute, or the electrical press of the country, could fill that part, if a popular inclination were directed in that direction. These institutions come in contact with men of just those classes in question, and the great benefit that would be a result (if carried out) is too obvious to need any arguing. An inventor would then know exactly where to turn when he has anything new in the departments mentioned. I think in any case that it would be to advantage to have the question ventilated in the electrical press, when undoubtedly several new points would come up, throwing further light on the subject.—*G. Emil Hesse, in the Electrical Age.*

IN the course of his researches among the mummy pits of Achmin, Professor Baeyer, rector of the University of Munich, has discovered cosmetics which had been in vogue among the belles of the land of Egypt at least three thousand years ago. The most notable of these beautifiers were found in the mummy case of an exalted titled personage, the Princess Aft. To enhance the power of the eye, a "brightener" had been employed containing an ingredient which seems to have been imported from far Hindostan, and its peculiar effect was to impart a verdant sheen to the iris.

© 1893 SCIENTIFIC AMERICAN, INC

The appearance of the World's Columbian Exposition on the 4th of July was most remarkable.

The number of paid admissions was 274,917, but in addition to this many thousand workmen and others who have passes went through the turnstiles, so it is safe to say that the total number of persons did not fall far short of 325,000. The crowd began to come at four in the morning. The gates were open to all comers at seven, and at seven-thirty there was a crowd at every gate. Cable cars, elevated, the Illinois Central and excursion trains poured in a solid crowd all day. The ticket sellers and turnstile men were powerless to prevent the congestion at some of the principal gates. In many cases it required half an hour to enter the grounds, but once inside there was room for all, and the people scattered among the buildings according to their individual taste. The grounds are closed at 11 o'clock at night, but the attractions were so many, and the crowd so great, that it was nearly one o'clock before the last remnant of the day's attendance had disappeared.

The first part exercises took place about midday in front of the Administration building, where a temporary platform has been erected. The programme was simple. Appropriate addresses were delivered by Mr. J. S. Norton, Vice President Stevenson, Mayor Harrison, and by Mr. H. L. Carson, of Philadelphia. An enormous concourse of people attended, the plaza facing the platform being crowded to its limits. While these exercises were being held, the day was being commemorated in Midway Plaisance in a manner most picturesque.

At noon representatives of the various concessions began to gather at the west end of the Plaisance. Many Bedouins dressed in their highly colored native costumes, and mounted on camels or spirited horses, seemed to take the lead. A large number of Turks with the Turkish and American colors intermingled followed after. The people from the Cairo street were fully represented in their native gala day dress. The actors, jugglers, and other people connected with the Chinese theater appeared in their richest robes. Natives from the Dahomey village and the Lapland village joined in the procession. By no means the least conspicuous feature in the gathering was a band of Pottawatomie Indians. All these and many others formed the center of a gathering of over 25,000 most curious-looking people that had gathered to commemorate the day. At a given signal the American flag was unfurled from a lofty pole, and in an instant there was a din of cheers and shouting from the assembled multitude, a salute from the British artillery, and a mixture of noises from fifes, tomtoms and a great variety of musical instruments from all parts of the world. As soon as silence once again reigned, the Mohammedan priest of the Plaisance, in his bright ecclesiastical raiment, offered prayer. The address at these exercises was delivered by Commissioner Burton. These exercises were carried out by the foreigners connected with the Plaisance, and Americans were interested in them only as spectators.

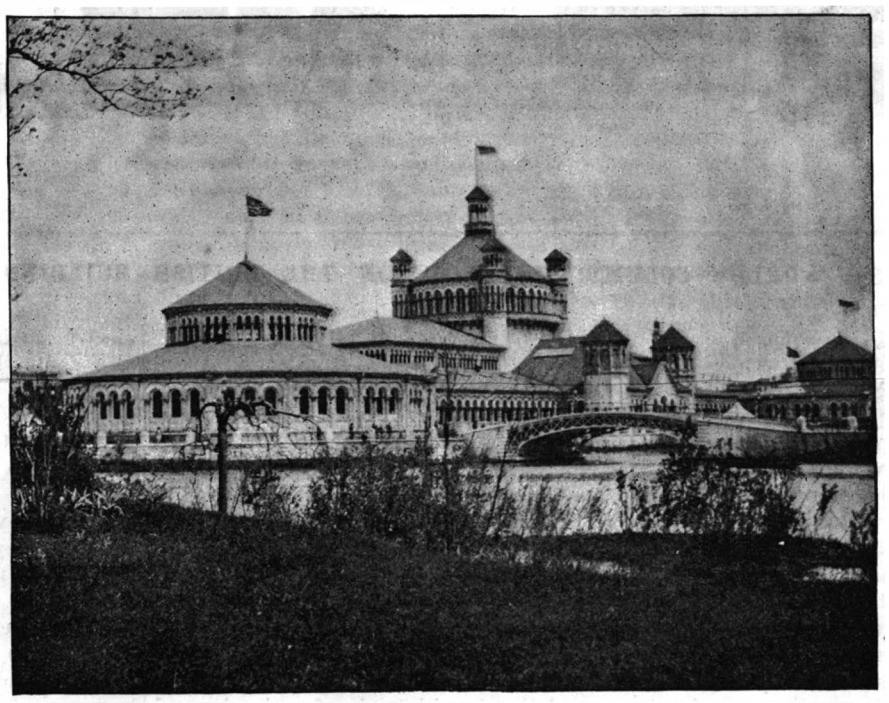
In addition to these special exercises, each concession observed the day in its own peculiar way. The German village was festooned with oak leaves. The Samoans sang "America" in their native tongue at the South Sea Island theater. The natives of the Javanese village bedecked themselves with American flags. The Chinese theater exhibited a flag upon which was written the Declaration of Independence in Chinese characters. The natives of the Dahomey village wore flags over their shoulders, and the American flag was conspicuous in the Street of Cairo, while in other concessions there was some special feature commemorative of the day. The Ferris wheel was decorated with bunting, and a brass band was stationed in one of the cars during the afternoon and evening, playing patriotic airs. This great wheel presented a magnificent sight at night, as the cars were illuminated and red fire burned at intervals, while the powerful rays of an enormous search light on the roof of the Manufactures and Liberal Arts building were thrown upon it, bringing out in strong relief against the darkness the enormous proportions of the structure.

Elsewhere in the grounds the day was fittingly observed. In the Delaware building exercises were held in connection with the new Liberty bell, which, unfortunately, was not cast in time to be present, but it was rung in the bell foundry in Troy, N. Y., where it was cast. A signal was sent by the Western Union Telegraph Co. from the Exposition grounds to the foundry.

The original American flag floated by Paul Jones was run up at the exercises held in front of the Administration building, and was also a feature at the exercises in the Delaware building. At the close of the exercises the people marched over to the Pennsylvania building, and this original flag was there spread over the original Liberty bell, which forms a part of the Pennsylvania exhibit. No event of the day seemed so much to touch the hearts of the people as this incident in the Pennsylvania building.

Appropriate exercises were held in the New York State building, and in the evening this building was brightly illuminated. Special observance of the day was also made in the buildings of Ohio, Illinois, Washington, California, Michigan, Wisconsin, Indiana, Colorado, and other States.

In the evening a grand display of fireworks was given from floats on the lake opposite the broad open space before the Manufactures Palace. This entire space, from the model battleship Illinois to Music Hall at the Peristyle, a distance of half a mile, was a mass of surging humanity. It was one of the finest pyrotechnic displays ever seen in Chicago. It began with a balloon, which sailed from the top of the Manufactures and Liberal Arts building out over the lake with what appeared to be a ball of fire hanging from it. When over the heads of the multitude, this ball of fire burst and there was spread out to view an American flag, with all of its stars and stripes and colors. The success of this display was greeted with great enthusiasm by the spectators. The set piece of the evening was a portrait of Washington wreathed in laurel and adjoining the words "The first in war, the first in peace, the first in the hearts of his countrymen."



THE PALACE OF FISHERIES.

Sunday, July 2, was observed at the Exposition as Patriotic Sunday. The exercises were largely attended by representatives of the army and navy, both retired and active, and many foreigners, connected with the Exposition in one capacity or another, were present. In one part of the exercises a bugler sounded the call "Taps," and, as the strains of the call died away, two sailors removed a large American flag which hung in the rear of the platform. The removal of this flag displayed the American naval colors, across the banner being inscribed the words "In Memoriam H. M. S. Victoria." One of the sailors placed a laurel wreath on the colors. The incident was carried out with such tenderness that tears came to the eyes of nearly everybody in the audience who recalled the tragic death of the crew of this British vessel.

In the main portion of the Fisheries building specimens of most of those things which industry and science have brought from lake, river, and sea are shown. Very interesting also is the exhibit of the United States Fish Commission, which gives a clear idea of the methods employed by it in deep sea work and in propagating fish to stock rivers and lakes. There is a large model of the seal fisheries at Alaska, etc. Professor Elliott, of the Smithsonian, the greatest authority in the world on seal life, superintended the construction of the models. One shows a "drive," and includes hundreds of mimic seals which the natives are driving along the ground to a place in the interior where they are killed. Almost every country in the world sends samples of the boats and the vast variety of appliances used to catch fish, besides pictures of fishing scenes and an infinite number of fish products. Norway is to the front in fisheries. In the exhibit of that country are models of the boats and the weapons used in assailing the walrus, the seal, and the polar bear. The Lofoden fisheries are especially well illustrated. No fewer than 30,000 men, with between 7,000 and 8,000 boats, come annually to fish for cod at the Lofoden Islands. Strange to say that among so many men there is no crime or disorder of any kind. Thirty million cod are taken each year. Gloucester, the American Lofoden, is nobly represented. A large model of the harbor shows warehouses and the fish docks with all the usual accessories. That great fishing center has now 400 schooners, of about 81 tons burden each. There is an interesting model of a fishing scene in Boston Bay. The water on which the boats float is well counterfeited. Down in the depths the nets may be seen, and on the floor of the bay there are the fragments of wrecks, the debris of a roadstead, and marine plants peculiar to the locality.

In the same building are models of whales, sharks, devil fish, mammoth lobsters, sword fish, sturgeon, etc. A novel way of advertising a fish glue may here be observed. Two pieces of belting, glued together, suspend an old rusty cannon taken from a British frigate that had been sunk in the St. Lawrence nearly two centuries ago. To add interest and variety to this part of the show there are introduced eel traps, lobster pots, machines which automatically remove the scales from fish, and a model of the menhaden fisheries which illustrates how these little fish are captured in nets, loaded in bulk in the holds of vessels, discharged like grain by means of elevators, and in brief the whole method of "handling" these profitable products of the deep. It is needless to say that in the department dealing with angling there is no other country in the world but America that could make an exhibit of anything like equal merit. Everywhere one turns, models are seen which compel admiration on account of the novelty, ingenuity, and evident efficiency of the various angling contrivances which originate in this country, are first employed here, and soon find their way to every civilized land where fish forms part of the natural resources. There is an American-made sportsman's canoe which invites attention. It is very strong and stable; it can carry three men with perfect safety; and yet it weighs only fifty-seven pounds.

No one can doubt the popularity of the aquarium in the Fisheries building. From the time that visitors are permitted to enter in the morning until late at night the corridors are crowded. Not only does every one seem to be pleased, but, without exception, all visitors appear to banish whatever might distract the attention from the instructive, beautiful, or curious exhibits. Those who have lived all their lives remote from the sea are anxious to make an acquaintance with living specimens of such fish as they have read about or have eaten with more or less satisfaction. On the other hand, the visitor who has had the music of the salt sea waves in his ears, and who has had the misfortune to be acquainted with streams and lakes that had been depleted utterly of their finny inhabitants, are just as curious to know all that can be known of the fresh water fish. It cost about $20,000 to place the fresh water varieties on exhibition, and at least $10,000 to perform the same service for the public with the denizens of the ocean. There is a hospital attached to the aquarium. There Dr. S. P. Bartlett, of Quincy, Illinois, ministers to such as disease has marked. Fungus gives him a good deal of trouble. It is just as contagious as smallpox, and only the most careful measures can save the victims or prevent them being the means of communicating the fatal growths to their healthy neighbors. The favorite remedy is to bathe the parts affected with a solution of carbolic acid. Notwithstanding all the care, the mortality from this ailment is considerable, being estimated at one-half of one per cent a day. To keep the water in a healthy condition all foreign matter is carefully removed, and fresh air is introduced by a system of pipes laid along the bottom of the tanks.

Sometimes Dr. Bartlett gives an exhibition of the tameness and playfulness of brook trout. He twirls his index finger in the water, and the fish rise in a body to make a rush at the finger and attempt to bite it, pushing one another aside without ceremony in their eagerness to reach the object of attraction. Lake trout are surprisingly fearless. They permit them-

(*Continued on page 38.*)

© 1893 SCIENTIFIC AMERICAN, INC

THE VICTORIA HOUSE, CHICAGO.

ROBERT W. EDIS, F.S.A., ARCHITECT.

We present a photographic plate of the British building, or Victoria House, at the great Fair, specially taken for the SCIENTIFIC AMERICAN, and to the *British Architect* we are indebted for our interior view and the following particulars:

This building forms the official headquarters of the Royal British Commission. In this building Colonel Edis, the architect, has happily embodied the picturesque qualities of an Elizabethan house, both inside and out, though the comforts and convenience which it boasts will perhaps impart considerably more satisfaction to the occupants than any of its artistic qualities. The comforts which Her Britannic Majesty's Commission may enjoy in this Victoria House are certainly in striking contrast to those which a nobleman enjoyed in the times of good Queen Bess, when "blessed with a large family and a retinue of 150 servants, he was content with but one large table and three long benches, as sole furniture for his great apartment of state."

Messrs. Johnstone, Norman & Co. have carried out the decoration and furnishing of the Victoria House, and it will be evident no effort has been wanting to make the British Commission offices worthy of their important function at the World's Columbian Exposition.

The modeled plaster ceiling of the hall is copied from a ceiling in that well-known example of old work in Wales, Plas Mawr, Conway. The ceiling over the staircase and principal landing of the hall is after an old example at Haddon Hall. The furniture herein is after the Italian Renaissance, and facing the entrance is a cassoné, reproduced from an old Florentine example in the Royal Palace at Naples, enriched with carving (in parts solid gilt), and a painted frontal panel, with gilded ground, representing the "Departure of Columbus from Spain," by F. Hamilton Jackson. A large arm-chair near displays in sculptured relief the discovery of America. The companion fauteuil, rendered in Francois Premier, is of that old kind known as "Caqueteuse," *i. e.*, cackle or gossip chair. Other furniture includes two fine old settles, copied from examples in the Pitti Palace at Florence. The tables were suggested by one in the Museum at Exeter. Two pedestaled knights in armor stand near the stairway, and the hall also contains an interesting specimen of a chiming "grandfather" clock.

In the reception room the modeled plaster ceiling is reproduced after the banqueting hall of Crewe Hall, and forms a counterpart of one used by Colonel Edis in building the ball-room at Sandringham for the Prince of Wales. In the furnishing of this fine reception room are included four beautiful cabinets, one an adaptation of Archbishop Sharpe's, a well-known example of "moulded cabinet work;" another copied from an old Scotch "aumrie" (French "armoire"), time James I., after one in the possession of the Bass family at Burton-on-Trent; the third, a richly carved example after a kind of Flemish design in the Cluny Museum; and the fourth, a walnut cabinet on cabriole legs after a Dutch design, a very fine example of marquetrie built up with ivory, ebony, box and mother-o'-pearl on pearwood. A table, copied from one at Aston Hall, a fauteuil (elbow chair) enriched with tarsia and carving, a King Charles chair of ebony, a side table of ebony, an arm-chair, a "Knole" chair, a "Cluny" chair, etc., samples from Haddon, Hardwicke, Speke, Ham House, and Hampton Court, are all comprised in the elaborate and costly furnishing of this apartment, and the whole makes a fine exhibit in itself of English cabinet making. The well-known ability of Mr. Owen W. Davis, in conjunction with Mr. Thomas J. Norman, is to be credited for the beauty and completeness of all this work.

The library is of oak with ribbed ceiling in geometrical pattern, and the furnishing is of a simpler and quieter character, as more befitting its uses. Here again old examples have largely served as models.

The dining-room has a modeled plaster ceiling, reproduced from the famous one at Campden House, the London residence of the Duke of Argyll. The oak paneling and furniture are of a simple treatment, suited to a modern room of Elizabethan style. The embossed leather, which is a noticeable feature on the walls here, as on the grand staircase and elsewhere, is one of the good things for which we are so much indebted to Messrs. Jeffrey & Co., of Islington, whose wall paper designs have been used throughout the Victoria House. The pattern of embossed leather in the dining room is the same as that specially designed for the Prince of Wales' ball-room at Sandringham for Col. Edis.

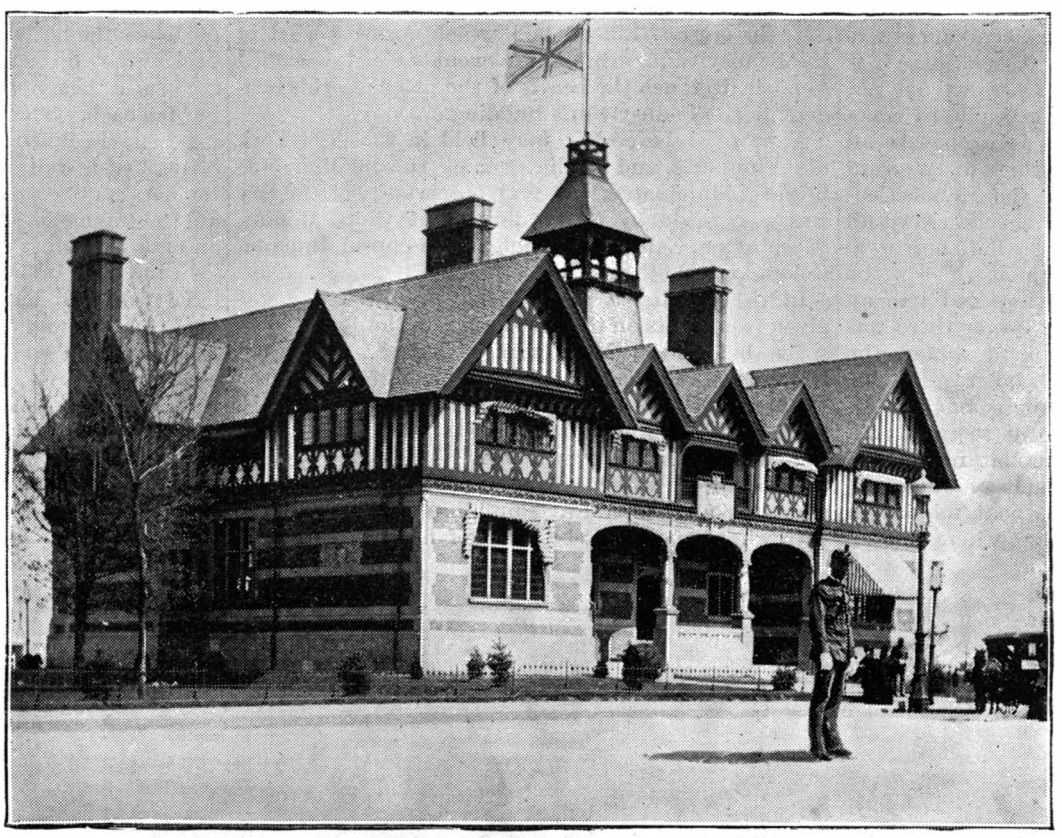
The Commissioners' room is a handsome apartment on the first floor, for use of the members of the Royal Commission, and serves the uses of a club and a business room. The furniture is of oak of antique character, designed by Mr. Owen W. Davis.

For the carpets throughout the building hand-woven Axminster have been chosen from the Royal Carpet Works, at Wilton, near Salisbury, by Messrs. Yates & Co. The stoves, fenders and fireplace fittings were designed and executed by Feetham & Co., of Clifford Street. The iron backs to the hall stoves with the royal arms are replicas of one designed for the state vestibule of Windsor Castle, by Messrs. Johnstone, Norman & Co., in 1887.

The three beautiful stained glass windows on the grand staircase were specially designed and executed by Messrs. Campbell, Smith & Co., without whose admirable productions it appears no English exhibition would be complete.

The very cleverly treated electric fittings are by Starkie, Gardner & Co., who also made the locks and hinges of wrought and polished iron largely after old examples.

We are indebted for some particulars of our description to Mr. C. Eyre Pascoe's dainty little souvenir of the Victoria House.



THE WORLD'S COLUMBIAN EXPOSITION—THE BRITISH BUILDING.

CONTRARY to the opinion of very eminent geologists, Prof. Bonney contends that glaciers exert no excavating action, and this conclusion he bases on facts observed by him in the Swiss Alps. He had followed up many of the valleys in Switzerland, and the work of the glaciers in every instance should, he believes, be classed rather as abrasive than erosive. In the absence, however, of the erosive theory, it will be difficult to account for the present character of many of the lochs on the west coast and in the interior of Scotland.

THE WORLD'S COLUMBIAN EXPOSITION—INTERIOR OF THE BRITISH BUILDING.

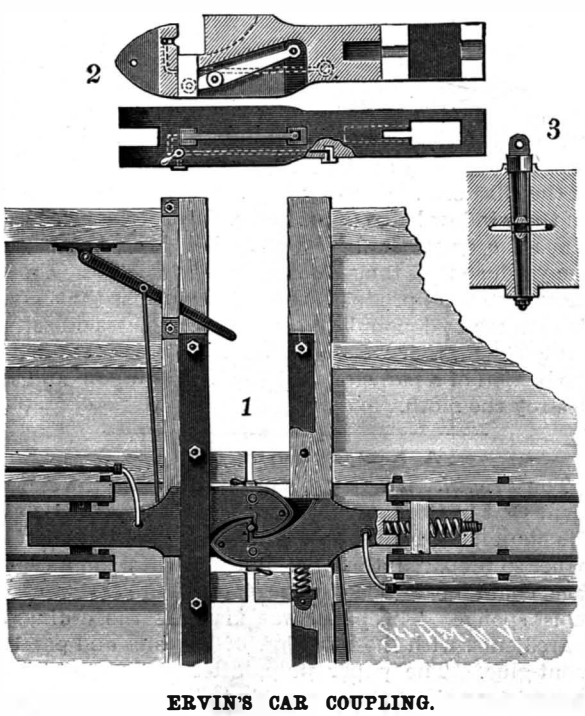
© 1893 SCIENTIFIC AMERICAN, INC

Combination Cement and Iron Bridge.

A new bridge was recently completed over the River Neutra, in Hungary, according to a system devised by Robert Wunsch, and consists of beton arches in which iron skeleton framework has been incorporated. The iron work comprises not simply single iron rods, but complete trusses made up of horizontal upper and parabolic lower chords. Cross girders and tie rods, however, have been entirely omitted and are supplanted by the beton. The wooden false work of the bridge was built to form a series of moulds, each mould constituting one complete bridge arch, and after the iron work had been put in place the beton was dumped in and thoroughly rammed. The work was divided up, so that the beton filling of each arch was completed in one day, and the false work was kept in place for an average of 37 days for each arch. The bridge piers also consist of beton. There are, in all, six arches. The total length of the bridge is 377½ feet and the width 19·7 feet. The whole work of construction was completed in four months, including the time consumed in driving piles for the pier foundations.

AN IMPROVED CAR COUPLING.

This coupling is so secured to the cars as to prevent its pulling out, and its interlocking jaws render the telescoping of the cars impossible. The improvement has been patented by Mr. Robert N. Ervin, of Cleburne, Texas, a locomotive engineer of twelve years' experience, and at present an employe of the G. C. & S. F. R.R. Fig. 1 shows the application of the device in a bottom plan view of the meeting ends of two cars coupled, Fig. 2 being a horizontal section and side elevation of a drawhead. Each drawhead has its hooked nose transversely recessed to receive a tongue of an adjacent coupling, preventing vertical displacement, and is adapted to receive the link of an ordinary link and pin coupling, for which a pin hole is provided. Each drawhead has an interior passage, the inner end of which has a nipple to receive the coupling device of the train pipe of an air brake system, while its outer end opens into a vertical tapering socket in the interlocking face of the hook, such faces, when engaged, forming a seat for a plug, as shown in Fig. 3, having a straightway port to make the passages continuous from car to car. The plug preferably has a metal core, surrounded by a rubber jacket or packing, and an eye by which it may be chained to the car. The shank of the drawbar is shorter than usual, and side bars, between which the drawhead is loosely secured, are bolted to the draw timbers or sills, springs being interposed on either side of the pin or key. The drawheads are close up to the dead-blocks or bumpers, so that the force of meeting cars will be largely expended on the bumpers. Only a small portion of the rear end of the drawbar is confined between the draught timbers, thus allowing the body of the car to move from one side to the other in rounding curves, while the jaws of the drawhead remain rigid, and are subjected to a straight pull all the time. For uncoupling, a push piece is arranged in a transverse cavity of the drawhead, and jointed to a lever connected by a rod with a hand lever at the side of the car. This lever may be placed in such position as the construction of the car may render convenient. It is impossible for the coupling to part



ERVIN'S CAR COUPLING.

by one car dropping lower than the other, and with this coupling all danger to trainmen in coupling and uncoupling is avoided.

Glycerine for a Cough.

In severe paroxysms of coughing, from whatever cause, a tablespoonful of glycerine in hot milk or cream will give speedy relief.—*Annals of Hygiene; Med. Rec.*

THE SILVER STATUE OF COLUMBUS.

Among the more remarkable exhibits at the World's Columbian Exposition is the silver statue of Columbus, which pertains to the splendid exhibits made by the Gorham Company.

The statue depicts the hero in his most important role. The figure is designed and modeled by Bartholdi, the contemporary French sculptor, who is so well and favorably known to the American people from the statue of "Liberty Enlightening the World."

As a work of art, this statue has been pronounced by

BARTHOLDI'S SILVER STATUE OF COLUMBUS.

connoisseurs to be a masterpiece. Life and vigor are implied in every line and feature, and the general effect is one of great beauty. Combined with this fact is the significance as being probably the largest figure ever cast in silver and the success attendant upon its conception and production. The statue is somewhat more than life size, being slightly over six feet in height and standing on a silver pedestal about a foot high. Thirty thousand ounces of sterling silver, 925–1,000 pure, was used in the casting. The finish is such as best to preserve the whole vigor and spirit of the sculptor's model rather than as a specimen of the chaser's art. The metal is finished in the oxidized form, thus allowing much more expression in light and shade effects than as though highly polished. The latter style of finish would give simply a colorless, lifeless picture, unrelieved by darker tints.

The process of casting was not essentially different from the ordinary mode of procedure in bronze, except that more care was taken in the details. The sculptor first made in clay his complete model exactly as it is to appear in the finished statue. Then a mould was taken of the model by applying a heavy layer of plaster of Paris. The plaster mould was then removed in arched sections, so that being removed they could be placed together so as to form a complete figure with the outlines on the interior. From this mould a plaster of Paris cast was made, thus reproducing in plaster the identical figure first modeled in clay. The plaster cast, covered first with a coating of shellac to prevent the absorption of moisture, was then ready for the founder, and in this form was shipped from the studio of the sculptor at Paris to the works of the Gorham Company at Providence, R. I.

At the foundry the plaster cast was first put on a soft bed of sand and covered with a layer of moulder's sand shaped into arched sections, as was the plaster mould, and a sand mould thus formed which could be taken off the cast and put together again. An outside frame of sand, beaten hard over the sections, served to keep the layer intact. After this step was completed, the sections were removed and a coating of liquid plumbago or black lead applied to the inner surfaces. The moulder's, or French sand, is of a peculiar nature, containing the qualities of a pliable clay and a coarse sand, which will allow, by its porous composition, the escape of gases generated in the interior. The lead-coated sections, after being put together, were secured by perforated iron pipes running through the figure in all directions, like a venous system. A second cast was then made from the second mould by packing the mould full of sand mixed with a flour paste, so that the particles of sand will cohere; the sand model being held together and in place by the iron pipes which traversed the interior of the mould.

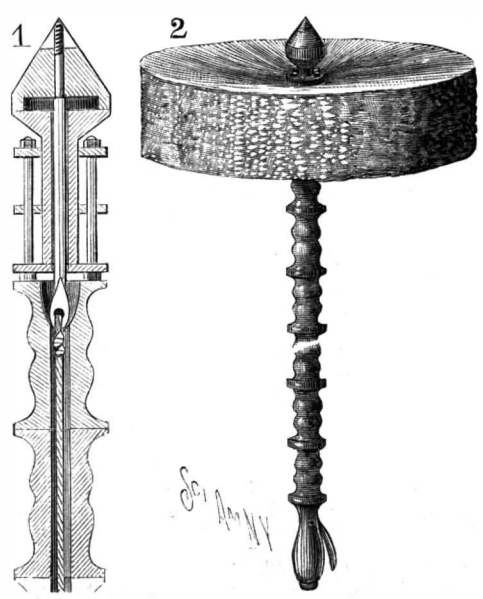
Again the sections of the sand mould were removed, the plumbago still adhering and remaining on the interior surface. The sand model or core, bared from the outside shell, was then shaved down to a depth corresponding to the thickness of metal in which the statue was to be cast, and then painted with a layer of plumbago as the interior of the shell or mould. Both shell and core were then ready for the oven, and after being subjected to a three days' bake they were dry enough for the operation of pouring. Then the sand shell was built up again over the core, and the whole fastened and held together by an iron frame. Thus the final mould for the casting consisted of the space bounded on the outside by the sand mould, giving the exact outlines of the original plaster and clay models, and on the inside by the sand core, which has been reduced in all parts, corresponding to the depth of metal to be cast. The entire mould was then covered with a heavy outside coating of sand through which channels are cut leading to all parts of the interior space. These channels are for the purpose of causing an even and rapid distribution of metal, and extend from the top or mouth of the mould where the metal is poured, through the outside layer in tortuous pipe-shaped passages to the various parts of the mould.

Four black lead crucibles containing the ton and a quarter of precious metal were placed in the furnaces after the completion of the final mould. After about four hours the molten contents of the crucibles were at a white heat and all was in readiness. One by one each crucible was lifted by a chain fall and the contents poured into a large iron bucket and thence to the huge mould buried in sand. After a few hours the casing was sufficiently cool to allow the removal of parts of it; enough to show, to experienced eyes, that the casting was practically perfect.

Thus was brought forth in almost heroic size the picture in silver of Christopher Columbus; a masterpiece of the great sculptor and a perfect exemplification of the ability of the founders to successfully overcome the difficulty of casting a life-size figure in solid silver.

A FLUE AND CHIMNEY CLEANER.

This is a simple and inexpensive device which may be readily passed into and through a chimney or flue, to clean it, its flexibly connected handle sections conforming to the shape of the flue, so that it may be introduced from a room and moved upward or downward as desired. Fig. 1 is a longitudinal section and Fig. 2 a perspective view of the device, which has been patented by Mr. William H. Bliss, of Kansas City, Mo. (Station A.) The brush section has a central eye bolt on the outer end of which is a conical cap and lock nut, the eye bolt being surrounded by a tube and three or more disks, the latter forming clamps between which the brush material is held, and the disks being drawn together by bolts provided with suitable lock nuts as shown in Fig. 1. A cord attached to the eye of the eye bolt of the brush section extends through handle sections of spool-like form, the number of sections employed varying with the length or height of the flue or chimney to be cleaned, the other end of the cord being knotted or attached to a nut on the outer



BLISS' FLUE AND CHIMNEY CLEANER.

end of the last section. The latter section also has a side recess in which is pivoted a cam adapted to engage the cord to hold it taut after the different sections have been put in place. In introducing the brush into a chimney or flue, the spool sections are added until the brush section has been forced practically through, when the outer handle section is added and the cord tightened, after which the cleaner is moved in or out as deemed necessary.

© 1893 SCIENTIFIC AMERICAN, INC

WORLD'S FAIR NOTES.

(*Continued from page 35.*)

selves to be fondled very freely and do not appear to dread any harm, even when the hand is thrust in among them with some violence. Rare beef and sea lettuce are much relished by fiddler crabs. The human-like action of the claws displayed by these animals when selecting certain morsels and conveying them to the mouth is at first very interesting to note, and a strange impression is produced when an identity of process in effecting the same end is observable in creatures so far removed in the scale of creation as a human being and a crab. Visitors make, apparently, an endless number of discoveries for themselves in their inspection of the tanks. No one leaves with an appearance of weariness, and many persons can be seen day after day, whatever other attractions there may be elsewhere, hastening to have a glimpse, however brief, at the contents of the aquarium.

The Scenic theater, which has a seating capacity of one hundred, is lighted and cooled by electricity, and the performance is entirely electrical. The performance is called "A Day in the Alps." A perfect Swiss view is shown, with snow-covered peaks and valleys, while in the foreground are pleasant Swiss chalets. The opening scene is just before daybreak; after a faint glimmering of stars the sun begins to gild the snow-capped peaks, the mist is dispelled, and you can hear in the distance the peasants singing the "Jodel." A storm then comes up. This is a very realistic performance—thunder, lightning, and rain follow each other in quick succession. The sunset follows with the never-to-be forgotten after-glow, the moon comes creeping up behind Mont Blanc, and the stars shine brightly. The effects are very wonderful, and the audiences are delighted.

The second spun glass dress ever made is now the property of the Infanta Eulalia, the first being made for an actress. The glass was spun at the great Exposition in the Libbey building in the Midway Plaisance. From a glass cylinder half an inch in diameter and a yard in length, over 12,000,000 feet of filmy thread was spun, and this, it is said, was woven into twelve yards of material, which was made up into a dress for the Infanta by a New York modiste. The wheel on which the glass was reeled is 18 feet in diameter, and revolves 350 times per minute, or at the rate of about 70 miles per hour. The extremity of the glass rod, from which the thread is drawn, is heated to a high degree, so as to melt the glass, which is then drawn out by the wheel into a fine thread and wound on the periphery of the wheel as fast as it is formed. The fabric looks like heavy white satin, but has a most beautiful sheen. Such dresses may do to look at, if kept in a glass case, but their use would be rather dangerous, owing to the small bits of fine glass that break off in handling, and are likely to float in the air and enter the eyes and nose.

The Blackening of Incandescent Lamp Bulbs.

A recent paragraph in the *Digest*, referring to one of the theories of the blackening of lamp bulbs, namely, that it is due to the evaporation of carbon, recalls a paper by Prof. Elihu Thomson, published in a recent number of the *Lehigh Quarterly*, which shows that he has held this view for many years, his experience since then having tended to confirm his views. The paper is entitled "The Life of Incandescent Lamps," and contains a number of points of interest, some of which may not be generally known.

In answer to the question, Can a filament be made which will not deteriorate and therefore not blacken the interior of the bulb? he is inclined to think that it cannot, if carbon is adhered to, and carbon as yet seems to be the best material in existence; it is so on account of its infusibility and its apparent volatility. It actually does soften at extremely high temperatures, and will bend readily when so softened. It does not melt at the highest known temperature, but it readily vaporizes in the arc lamp. It is very probable that carbon, infusible as it seems, could be fused at arc temperatures while under pressure. Thus, an electric arc in an inert gas at high pressure would probably drip melted carbon, which would form graphite in masses or crystals.

The deterioration of incandescent lamps has often been laid to the bombardment of gas molecules, but Prof. Thomson has long been convinced that in a well exhausted lamp it is due almost entirely to evaporation by high temperature. Just as ice evaporates in vacuo, so carbon acquires in vacuo a certain volatility at an increasing rate of the temperature. He assumes, of course, that the vacuum is so good that none of the bluing or visible discharge of current takes place, which of course wears the filament by actual carriage of carbon. He thinks that it would be very strange if carbon maintained at so high a temperature in a vacuum did not evaporate at all, as it is well known that almost all substances raised to a sufficiently high temperature do give off insensible vapors, and that melted metals frequently behave as mercury does at the ordinary temperature; the presence of foreign substances and gases will in some instances accelerate the action or perhaps in other cases retard it. In a lamp a certain evaporation takes place which is independent of the size of the bulb, from which it follows that the age coating will become much less as the bulb is greater in size, for the same deposit will yield a much thinner coating of carbon over a large surface than over a small one. If one lamp were made with the smallest possible bulb and another with a large bulb, the former might be rendered opaque, while the latter would only be slightly darkened, other conditions being the same. He puts great stress on the uniformity of the filament, and gives the reasons. It appears to be true, he says, that the limit of practical improvement in the efficiency of incandescent lamps is to be found in the properties of the element carbon, and particularly its volatility. It is fairly safe to say that no other less volatile substance has yet been found, and that carbon, as pure and perfect in structure as possible, is likely to hold its place, at least for some time to come, as the material for incandescent lamp filaments.

Family Life Among the Tibetans.

Some very interesting sketches have been given in *Leisure Hour* by Miss Isabella Bishop, descriptive of her journeyings in Tibet, that inaccessible and rarely visited corner of Asia.

Family life, she says, presents some curious features. In the disposal in marriage of a girl, her eldest brother has more "say" than the parents. The eldest son brings home the bride to his father's house, but at a given age the old people are "shelved," *i. e.*, they retire to a small house, which may be termed a "jointure house," and the eldest son assumes the patrimony and the rule of affairs. I have not met with a similar custom anywhere in the East. It is difficult to speak of Tibetan life, with all its affection and jollity, as "*family life*" for Buddhism, which enjoins monastic life, and usually celibacy along with it, on eleven thousand out of a total population of a hundred and twenty thousand, farther restrains the increase of population within the limits of sustenance by inculcating and rigidly upholding the system of polyandry, permitting marriage only to the eldest son, the heir of the land, while the bride accepts all his brothers as inferior or subordinate husbands, thus attaching the whole family to the soil and family roof-tree, the children being regarded legally as the property of the eldest son, who is addressed by them as "Big Father," his brothers receiving the title of "Little Father."

The resolute determination, on economic as well as religious grounds, not to abandon this ancient custom, is the most formidable obstacle in the way of the reception of Christianity by the Tibetans. The women cling to it. They say, "We have three or four men to help us instead of one," and sneer at the dullness and monotony of European monogamous life! A woman said to me, "If I had only one husband, and he died, I should be a widow; if I have two or three, I am never a widow!" The word "widow" is with them a term of reproach, and is applied abusively to animals and men. Children are brought up to be very obedient to fathers and mother, and to take great care of little ones and cattle. Parental affection is strong. Husbands and wives beat each other, but separation usually follows a violent outbreak of this kind.

It is the custom for the men and women of a village to assemble when a bride enters the house of her husbands, each of them presenting her with three rupees. The Tibetan wife, far from spending these gifts on personal adornment, looks ahead, contemplating possible contingencies, and immediately hires a field, the produce of which is her own, and which accumulates year after year in a separate granary, so that she may not be portionless in case she leaves her husband!

THE long distance transmission plant of the San Antonio Light and Power Company, Pomona, Cal., has now been in successful operation for the past six months, transmitting a distance of twenty-eight miles. The hydraulic part of this plant, the *Electrical Engineer* says, was installed by the Pelton Water Wheel Company, and one of the principal attributes to the successful operation of the plant is their new regulating apparatus, which, it is stated, controls the speed of the wheel perfectly under the most exacting conditions as to variation in load on the generators.

With this new system of regulation which has been developed by this company, the successful operation of any plant which they install is now assured. The regulating appliances heretofore used in connection with water power plants gave but indifferent results.

Perhaps the most severe test that a water wheel governor was ever subjected to is in the case of a Pelton wheel running a set of circular saws at the mill of the Red Cross Lumber Company, in the northern part of California. The wheel is operated under a vertical pressure of 485 feet. The saws require to drive them through the log at full feed 125 H. P. They take about seven cuts per minute, thus varying from full load, namely, 125 H. P., to only what is required to drive the saws running free. During this operation the variation in speed is not perceptible.

One of the most valuable features of the regulator is that it is positive in movement, and there is no danger whatever of its racing, thus admitting of its being geared so as to be extremely sensitive and to meet the requirements of electric railroad work, in which the changes are tremendous.

Magnetism is Without Effect on the Human Body.

Mr. A. E. Kennelly, of the Edison laboratory, and Dr. Frederick Peterson, of the College of Physicians and Surgeons, have reported to the American Electro-Therapeutic Association the result of their experiments on the effect of magnets on the human body. Experiments were tried on cats, frogs, boys, and themselves. Human and frogs' blood failed to show any traces of polarization, movement, or vibration. In the case of live frogs, no influence of the magnet on the blood cells or the movement of the blood could be found.

To test the German theorists' claims that magnetism increases the resistance to conduction in motor nerves and causes paralysis, a small dog was placed in a cylinder between large field magnets and kept there for five hours under the influence of a strong magnetic current. The exposure seemed to have no effect on the dog, and he came out as lively as he went in. Then a boy was placed between the magnets and a magnetic current was turned on. There was no effect upon the boy. The magnetic current was strong enough to balance a heavy bolt in the air and to contract wires of iron and to hold iron chains so strongly that it required the efforts of several men to detach them. Then the experimenters themselves and their men took turns in lying down on a board placed between the poles of a huge magnet with the current alternately turned on and off. One observer would hold the wrists of the subject and take sphygmographic tracings of the pulse. The second observer would observe the respiration, and the operator would turn the current on and off. No changes were observed in the tracings, or in the respiration, or in any other way. One subject held a steel screw in his hands, while he could tell from its attraction whether the current was on in the magnets. He had no sensations of any other kind. The observers concluded that the human organism is in no manner affected by the most powerful magnets known, and that the brain and the nerves get no sensations or impulses from the magnets. They say that it may be possible that some day magnets may be invented where the number of reversals to the second is high enough and the force strong enough to produce effects on the nervous system, but that so far as the experiments show, electromagnetism seems to have no influence whatever on the human body.

Fighting the Gypsy Moth.

The Massachusetts Agricultural Society employs one hundred men in fighting the gypsy moth. Each man has charge of a district about a mile square. Whenever moth clusters and nests are found, they are collected by the wagon load and burned. Paris green in large quantities has been used in spraying the infected trees and grass. The work of extermination has been going on for the last five years, and until this year the results were far from encouraging. The pests had spread over 200 square miles in the northeastern part of the State, causing desolation equal to that by fire or flood, and $275,000 had been appropiated by the State legislature for their destruction. The moths are said to have been introduced in this way: M. Trouvellot came to this country from France about twenty years ago, and, settling at Medford, studied the cultivation of the silkworm. One day he placed half a dozen eggs on the window ledge of his home. During a brief absence the eggs were blown off and scattered through the yard, so that their recovery was impossible. From these eggs were produced the army of moths that have done much to depopulate a large part of Massachusetts. Professor Lintner has suggested the discovery and introduction of a parasite that would feed upon and so destroy the moth.

A New Prepared Paper.

The *Droguisten Zeitung* is responsible for the statement that in Germany a patent has been refused, and the manufacture and sale have been prohibited, of a paper so prepared that any ink-writing upon its surface could be erased by the simple application of a moist sponge. The paper was made of the ordinary ingredients, with the addition of asbestos and parchment-glue. The paper pulp, after rolling, was immersed for a short time (from six to thirty-five seconds, according to the thickness of the paper to be prepared from it) in concentrated sulphuric acid at 20°, diluted with 10 to 15 per cent of water. It was then pressed between glass rollers, passed successively through water, ammonia solution, and a second time through water, strongly pressed between rollers and dried on felt rollers, and, finally, on polished and heated metal rollers. The finished article is said to be precisely like ordinary paper. Its sale has been prohibited on account of the misuse to which it can be put.

© 1893 SCIENTIFIC AMERICAN, INC

The History of Patents.

To the *Practical Engineer* (London) we are indebted for the following facts and anecdotes relative to early patents, the names of many discoverers, and the date of the inventions: While the lawyers and the treasury were wrangling over who could consume the greatest amount of seed corn wrung from inventors, about the year 1775 the treasury made one of its fiscal errors (so costly to the nation), which had an important bearing on patents of invention. Just as it shamefully overtaxes impoverished inventors now, without rhyme or reason, on a fiscal error which has lost it (or rather the public) £50,000,000 since 1852, so in the year 1775 it tried taxing the American colonies in the matter of tea entering Boston harbor. The colonies would not pay its exaction, and, fortunately, were far enough off to resist. A war followed, lasting many years, until on September 3, 1783, we had to acknowledge the independence of the colonies, and swallow the unpleasant fact that the fiscal error of the treasury had lost us America. One effect of this separation of the colonies was that all the old "£4 16s. 6d. extra fee" colonial patents running in America were, of course, canceled thereby. New patent laws were required in America in place of the old law, deceased, and the outcome was the creation, in 1790—1793, under George Washington, by Jefferson, of the best patent law that has ever existed—a law which has not only scattered untold benefits throughout America, but from which we in this country are also receiving reflected benefits. The fundamental principle of the American act is that "inventors and authors have equal and similar claims to the protection of the legislature"—in other words, that protection to inventors should be valid, and not a sham, and that lawyers and the treasury should not be allowed to plunder them. It is not difficult to realize why America took such care to cut absolutely clear from our chancery system. It would result from the fine object lesson chancery had previously given the world in their treatment of James Watt. If our patent system had been anything but a delusion and a snare, it would have protected an inventor such as James Watt, who gave the world the steam engine. It did nothing of the kind, but let him in for ruinous lawsuits, that ate up the whole of his profits for the natural term of his patent. What likelihood could there possibly be of protection for any humbler inventor, after such treatment of Watt? None whatever. The protection sold by the British Patent Office was evidently a farce, a very costly farce, too, at about £400 per patent for the United Kingdom. To such a miserable strait had the wrangling lawyers brought our patent laws at this period.

The establishment of the American patent system in 1790 was the protest of business men against the violation of all the true interests of invention by lawyers, who could not appreciate them. The movement was to invention what Luther's movement was to the abuses of the old Catholic Church: the spirit of invention was preserved, but the mummery was thrown aside. Inventors should remember that date—1790—as that when invention asserted its freedom. To avoid the old chancery trickery over worthless titles, leading to endless lawsuits, the American system introduced the preliminary examination system, and granted only patents which were as valid and safe from lawsuits as they could possibly be made. It gave these valid titles with business dispatch, instead of with endless legal delay, it printed its specifications in English, on paper, so that they could easily be consulted by inventors, instead of "engrossing them on skins, in black hand, in the Latin language," which was only fooling with invention. It gave 17 instead of 14 years for the duration of a patent, or 21 per cent more time. It charged only £7, instead of £400 for a United Kingdom patent, or only one fifty-seventh part of the lawyer's price. Here was abuse done away with at a stroke, but the effect on the fee hunters of chancery and the treasury would make them hate the American patent system as the Pope hated Luther. First, they would hate it because they would feel that for 167 years they had betrayed their trust, and been plundering instead of encouraging invention. Secondly, they would hate it because the business men at the head of the American Patent Office would be no party to the issue of worthless titles to patents out of which the lawyers could make "six or twelve fold law costs" in subsequent trials. Third, they would hate it because, if America issued patents at one fifty-seventh of their charges, it demonstrated beyond question that fifty-six parts out of the 57 charged had never been other than shameless extortion. Fourth, above all they would hate it from the fiscal error of the treasury having lost the American colonies, so that nothing coming from America could possibly have any merit in it whatever. The effect of this deep hatred of all things American 100 years ago has blinded us to the intrinsic merit of America's patent system, and withheld from the English people that which in their own interest they ought to have had from the very first.

The American patent system, working in the interest of the public, demonstrated to them its commercial value in the first few years. In 1791 Fitch, and in 1793 Fulton, invented practical steamboats. In 1794 Whitney invented the cotton gin. Cotton planting at that time was languishing, and Whitney's invention made it exceedingly prosperous. Congress voted sums to assist invention, and at Washington a fine museum was erected, containing models and records of considerable public interest. When General Ross took Washington, in 1812, and burnt the Capitol, it was proposed to treat the Patent Museum after the same fashion. "A loaded cannon was trained upon it, when its director, Dr. Thornton, put himself before the gun, and in a frenzy of excitement exclaimed, 'Are you Englishmen, or only Goths and Vandals? This is the Patent Office, the depository of the ingenuity and inventiveness of the American nation, in which the whole world is interested. Would you destroy it? If so, fire away, and let the charge go through my body.' The effect is said to have been magical upon the soldiers, and to have saved the Patent Office from destruction." Our soldiers would report this incident when they returned home to England; news would be constantly reaching our persecuted inventors of the success of friends and relatives in America, under its patent system; many of our ablest inventors would leave this country for America in consequence, while a general feeling of unrest under our vicious, lawyer-ridden system would spread far and wide in this country. The knowledge among inventors that justice is granted them in America, and withheld them here, has led to the frequent forcing of the patent question on Parliament during the century. The 1790 prejudice against the American system has, however, always been sufficient to continue gross abuses in our patent system down to the present day. We have seen what came of a fiscal error of the treasury in 1775. Is it not about time it dropped the present one paralyzing invention?

During the 167 years from 1623 to 1790, the discouragement of the chancery system was such that only one useful invention appeared at an average of 3¼ years interval.

The best list of useful inventions that can be made out for this period only gives 14 of such for the first 100 years, and 37 for the remaining 67 years, up to 1790. Many of these inventions were not patented under chancery at all. They are as follows:

1623. Mannsell's glas patent.
1630. Ramsey's fire engine patent.
1643. Torricelle's barrometre.
1649. Pascal's hydraulic press.
1650. Otto Guericke's air pump.
1657. Huygen's pendulum clock.
1664. Hill's breechloader.
1672. Wooden railroads.
1676. Barlow's repeaters.
1688. Papin's steam engine patent.
1698. Savery's steam engine patent.
1716. Floating docks.
1721. Halley's diving apparatus.
1723. Streets lighted with hydrogen gas.
1727. Leupold's high pressure engine.
1732. Ledemour's pump.
1736. Hull's steam tug.
1738. Iron rails nailed to wooden sleepers.
1739. Emerton's wood preserving patent.
1747. Watson's electric telegraph.
1748. Paul's carding patent.
1752. Franklin's lightning rod.
1756. Strutt's stocking frame.
1758. Dolland's achromatic telescope.
1762. Wedgewood ware patented.
1764. Blackley's tubular boilers.
1765. Spedding's gas light.
1767. Hargraves' spinning jenny.
1768. Lace machinery.
1769. Watt's steam engine patent.
1769. Arkwright's spinning frame patent.
1771. Crompton's mule patent.
1774. Lesargis telegraph.
1776. De Jouffroy's steamboat trial.
1777. Bushnel's torpedo.
1780. Pickard's crank patent.
1780. Leblanc's artificial soda.
1780. Burgand's argand burners.
1783-4. Cort's iron patents.
1784. Bramah's lock patent.
1784. Montgolfier's balloon.
1784. Watt's locomotive patent.
1785. Cartwright's locomotive patent.
1785. Arkwright's power loom patent.
1786. Lebon's gas light.
1787. Betancourt's electric telegraph.
1787. Hamer's wool shearing.
1787. Symington's steam engine patent.
1788. Miller's steamboat trial.
1789. Galvarni's batteries, etc.
1789. Present rails and wheels invented.

THREE new torpedo boats have been ordered of Yarrow & Co. by the British naval authorities. They are to be 140 feet long by 14 feet 6 inches beam, and to have a guaranteed speed of 27 knots, which is equal to a little over 31 miles per hour.

Correspondence.

Scald the Scoundrels.

To the Editor of the Scientific American:

I see in some of late newspapers that five masked men halted and boarded a locomotive of the California express, June 10, 1893, and forced the engineer to take a sledge, batter in the door of the express car, wounded the messenger, and robbed the express. Now, I am an old engineer—too old to do good service, nearly 73 years old—and it grieves my soul to read of an engineer being forced to compliance to such devils as those. I think every locomotive that travels on those long, lonesome roads should be furnished with a hot steam jet, one on the fireman's side and one on the engineer's side, with elastic pipes that they can point the jet in any direction and blow a masked man's eyes out with steam before he had time to use a revolver, or any other suspicious character that comes within 20 feet of the locomotive. Now, please make this idea known to the master mechanics or superintendents of locomotives everywhere, and I know they can furnish them and extend a steam jet into the express car, so that they can turn steam into the car and scald train robbers to death before they could get out of the car, and put a mark on them that they could be distinguished for a month after. I am too nervous to write much. Please scatter the idea as broad and as quick as you can, and oblige an old man that loves his fellow man that is honest and hates a dishonest person.

THOMAS R. ALLEN.

Lucas, Lucas County, Iowa, June 17, 1893.

Shapes of Eggs.

Various attempts have been made to account for the diversity in shape seen in eggs. A recent study convinces Dr. Nicolsky that the differences may be all traced to gravity, and he finds his idea confirmed by all the eggs in the zoological collection of the St. Petersburg University. He supposes that pressure by the sides of the ovary tends to elongate the egg before the shell has hardened. In birds which keep a vertical position while at rest, as do the falcon and the owl, the soft egg is made short by the action of the weight of the body against the ovarian pressure; while in birds that, like the grebe, are nearly always swimming, the egg is lengthened because the bird's weight acts with the compression by the ovary. The egg is made more pointed at one end than at the other in birds that, like the guillemot, are frequently changing their position—sometimes swimming and diving, sometimes perching on the rocks, etc.

Soapsuds as a Lubricator.

I had a curious lubricating experience a few years ago that I would like to put on record, observes Gulf in *Railway Appliances*. The machine that gave me the trouble was for experimental purposes, for what purpose it matters not. The trouble lay in the lubrication of a shaft that had to make 4,000 revolutions per minute. It was about four and a quarter inches in diameter, with journals from eight to nine inches long, and carried a weight of 1,800 pounds. The thing simply wouldn't run cool. We cut oil grooves in the boxes; we scraped them; we used every kind of metal that we could think of; we hitched on a pump and pumped gallons of oil through those bearings; and yet, in from five to ten minutes, they would commence to heat, and nothing seemed to be able to stop it but the stoppage of the machine.

One day, in a fit of despair, we put soapsuds in the tank instead of oil and started to pump that in. Presto! The bearing had found the food for which it was craving, and proceeded to do its work with the cheerfulness of an old campaigner. It seemed that it was not so much the quantity of lubricant that was needed as a regular and continuous supply. The oils that we were able to use had a consistency that unfitted them for reaching the remote points under the rapidly revolving bearings, so it heated, while the soapy water was thin enough to be forced over the entire surface and keep everything all right. I presume that there are oils that would have done the same thing, only we did not happen to get hold of them. But if you ever attempt to use water, remember that you will need it all the time and in large quantities.—*Railway Review.*

Use of Compressed Air to Cool Journal Bearings.

In any place where air compressors are used steadily, or where an air supply is convenient, it is quite convenient to conduct a pipe so as to blow air upon the heated bearings, and thus cool their heated brows, as the air will conduct heat away nearly as well as water. Air has an additional advantage in the fact that it cools in expanding so as to still further aid in the cooling of boxes where this scheme is applied. We are inclined to agree with an exchange that it may seem visionary, but if you have a good chance try it, and see if it don't help keep them cool, the help depending upon the flow of air and the pressure from which it expands, as expanding air cools very rapidly.—*Railway Review.*

© 1893 SCIENTIFIC AMERICAN, INC

THE KRUPP EXHIBIT AT THE GREAT FAIR.

(*Continued from first page.*)

about 80 tons, and the total load on the rails was, therefore, nearly 230 tons. It was illustrated and described in the SCIENTIFIC AMERICAN of April 22, 1893.

The next gun that attracts attention is of smaller caliber, and though less monumental, is a far more serious weapon than the 122 ton gun. This is the 12·01 in. caliber; it is not a new gun, but is far more interesting on that account, for it has already withstood the severe test of 98 rounds, and is still in service as a naval gun. This is a specially interesting exhibit, because it is mounted complete on its turret carriage, and the hydraulic arrangements for working and loading are very well illustrated.

The 28 cent. (11·02 in.) gun is the next that attracts attention; this, as exhibited, is mounted on a coast defense hydraulic carriage, but the same type is also used for naval purposes. The length of bore is 40 calibers, or 36 ft. 6 in., and the total weight is 43 tons. This gun is mounted on a carriage which permits it to have a maximum elevation of 45 deg., at which angle the range is 20 kilometers (12½ miles); the weight of projectile fired is 759 lb., and the charge is 352 lb. of brown prismatic powder. With this charge an initial velocity of 2,066 ft. has been obtained. This gives a striking energy at the muzzle of 6,979 metric tons, reduced at a distance of 2 kilometers to 5,300 metric tons. This exhibit is made all the more attractive because it is inclosed within a shell-proof casemate, and it may be mentioned that as the gun was constructed last year, it may be considered to represent the latest Krupp type of heavy artillery.

A similar range of 12½ miles is that assigned to the next gun of the series shown in the Krupp pavilion; this is the 24 cent. (9·45 in.), intended for coast defense, and mounted on a coast defense carriage; the bore is 40 calibers in length, and the total weight of the gun is 31 tons; the maximum elevation that can be given is 44½ deg. A special interest attaches itself to this particular gun, because it was tested in the presence of the German Emperor at Meppen on April 28, 1892. On this occasion a range of 20,226 meters, or nearly 13 miles, was attained.

Various other guns and their mountings are shown.

The second part of the exhibit consists of armor plates manufactured at the Krupp works. Of these, perhaps, the most interesting are some compound and nickel steel plates. There is a compound plate, 15·75 in. thick, a nickel steel plate, 11·8 in., and a third of the same character, but of different quality, 10·23 in. thick.

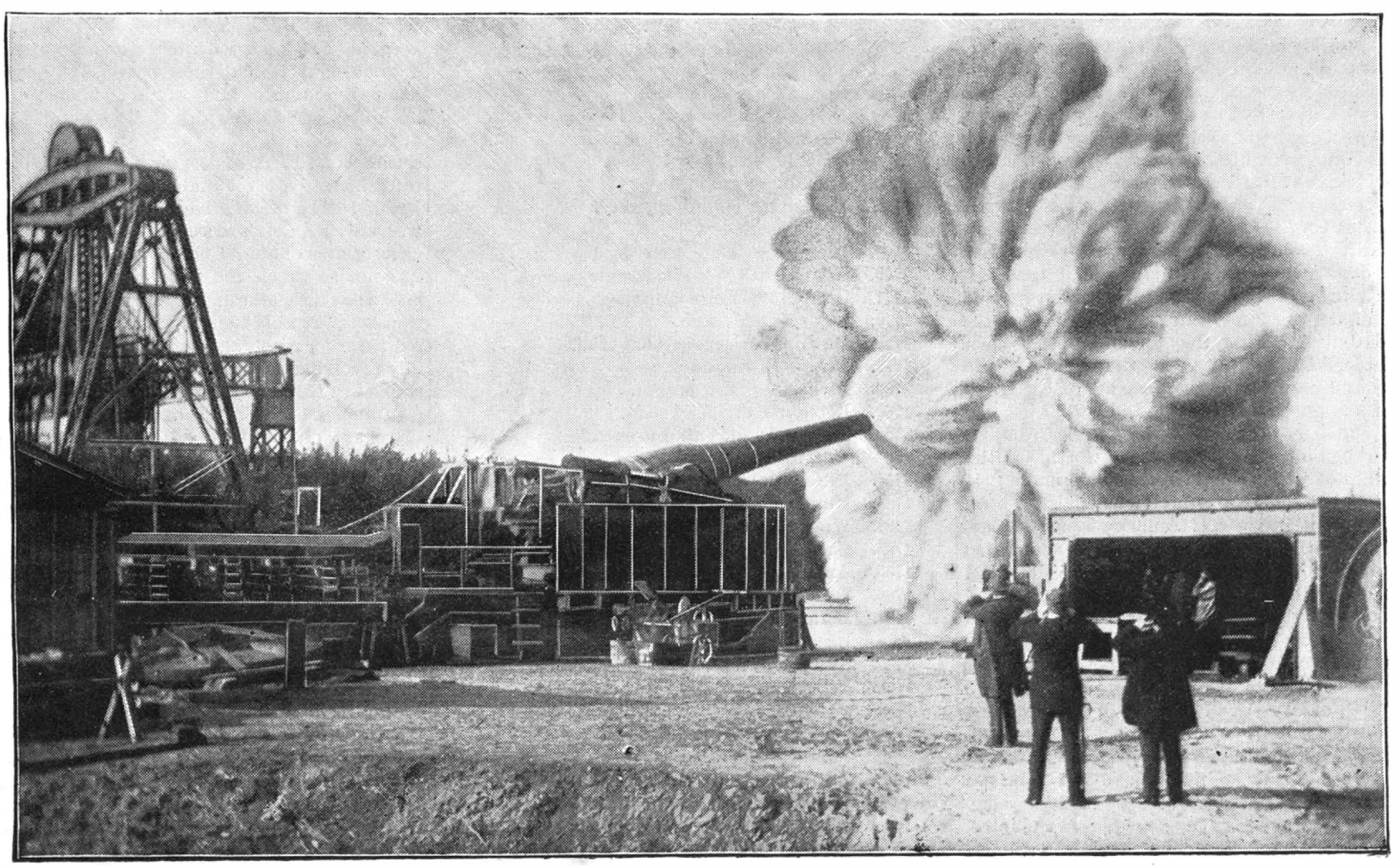
Passing from the exhibits coming from the armor plate section of the Krupp works, we come to those sent out of the plate mills of a lighter type. Probably this part of the exhibit will illustrate more clearly to a greater number of visitors the magnitude and resources of Essen. First comes a section of a boiler, weighing nearly 3½ tons; it is 12 ft. 10 in. in diameter, and the thickness of the plate is 1·5 in. The next heaviest plate weighs 16 tons; it is made of Siemens-Martin steel, and is 65 ft. 9 in. long and 1·26 in. thick. There are also some fine specimens of stamped and flanged steel plates for boiler work. The largest casting shown is to form part of a 5,000 ton stamping press; it weighs 62·4 tons, and is 12·2 in. thick; the length is 27 ft., and the diameter 44 in.

In railway material there is shown a group of 54 steel tires, a number of complete wheels, and a collection of axles. This part of the exhibit at least is of particular commercial value, because the Essen works have a large trade with America in this branch of their industry.

Of cast steel there are some notable examples. The largest is the bow frame for a new German ironclad; the part shown weighs 24 tons, and is 42 ft. high; this is made in three parts. There is also a portion of a stern frame for the same ship, in two pieces, weighing respectively 12·8 and 11·3 tons. It may be mentioned with regard to these castings that they could not be conveniently transported by rail, and were brought all the way from Essen to Chicago by water. There is also an engine bedplate of 6·3 tons; there are some examples of steel locomotive side frames, and a number of other objects, the most important of which is a reproduction of the screw of the German Lloyd steamers Spree and Revel.

There is also quite a collection of mining machinery, which has always been a specialty of Essen. The walls of the pavilion are hung with a number of views illustrating the Krupp works. At the end of the main hall are seven large drawings, three of them—the largest—being of the works, and the others plans of the Meppen testing grounds and diagrams of the progress and development of the Krupp industry. Beneath are two very interesting memorials, the first contributed by the workmen and employes in honor of the founder, the late Alfred Krupp, and the other a representation of the old dwelling place of the founder, a modest house that speaks eloquently of the developed fortunes of the family, thanks to the energy, talent, and opportunities of the founder. This house has been preserved intact as a memento, and is highly prized by all those associated with the works. A number of portraits of the more prominent directors and photographs of the more famous guns built at Essen complete this very remarkable exhibit. We have said enough, says *Engineering*, to show that not only has Mr. Krupp fully maintained the reputation of his firm by this remarkable exhibit, but he has added additional glory to the German section, and has contributed more than any other single exhibitor to the success of the World's Fair.

THE KRUPP BUILDING AT THE WORLD'S FAIR.



FIRING THE GREAT KRUPP GUN.

© 1893 SCIENTIFIC AMERICAN, INC

THE KANSAS EXHIBIT OF MOUNTED SPECIMENS OF THE ANIMALS OF THE STATE.

The exhibit of the State of Kansas at the World's Fair presents no more interesting feature than that of the superb group of specimens of its fauna, mounted in the highest type of taxidermy. In the cuts we illustrate some of the more striking features of this incomparable exhibit, whose size renders the reproduction of the whole within the limits of our columns quite impossible. The first group contains a number of the Rocky Mountain goats; one of the most difficultly procured specimens of this country. Mounted on the crags, this rock antelope—for it has now been relegated to the class of true antelopes—is seen at different stages of its growth expressing in its characteristic attitude and in the background on which it is mounted the life habits of the animal. Toward the foreground a beautiful group of deer present an object more familiar to the sportsman and naturalist. The great rarity of this antelope and the difficulty of reaching it in its almost inaccessible home makes the group one of the very highest value.

Next comes a specimen of the American elk or wapiti, one of the noblest specimens of the deer tribe that has ever existed, and surpassed in size by very few members of the deer family. Toward the background of this cut may be seen a bear looking forward toward the spectator.

But a few years ago the plains of Kansas swarmed with countless herds of buffalo; so plentiful were these that passengers on a railroad car used to indulge in the brutal amusement of firing at them as the train passed by the herds; now the animal is well nigh extinct, but a few hundred being left in the entire area of North America. Kansas accordingly presents among her other specimens a finely stuffed and mounted family of buffalo. Upon the plains which they inhabit vast numbers of antelope—the pronghorn—lived, and back of the buffalo a group of these animals is appropriately placed. The pronghorn is interesting as being one of the two representatives of the antelope tribe found in America, the Rocky Mountain goat being the other. The pronghorn is an exception to the antelope tribe in the fact that it sheds annually the sheaths of its horns, in a measure similar to the deer family.

The greatest member of the deer family, the shooting of a specimen of which is one of the greatest glories of the American hunter, is the great moose. With its high withers, short neck, prehensile upper lip, and great flat antlers, it forms a most striking object. The Kansas exhibit is rich in mounted specimens of this animal. In one group an animated reproduction of a battle between two of the bulls is shown, destined, it may be imagined, to end in an interlocking of the antlers, with death of both combatants. As if with some such expectation as this, a party of wolves are awaiting the issue of the combat.

The more peaceful aspect of the moose's life is shown in the next group, where the family—father, mother, and fawns—are shown peacefully assembled. When it is noted that this animal may stand seventeen hands high, or as high as a very large horse, the impressive aspect of these groups may be imagined.

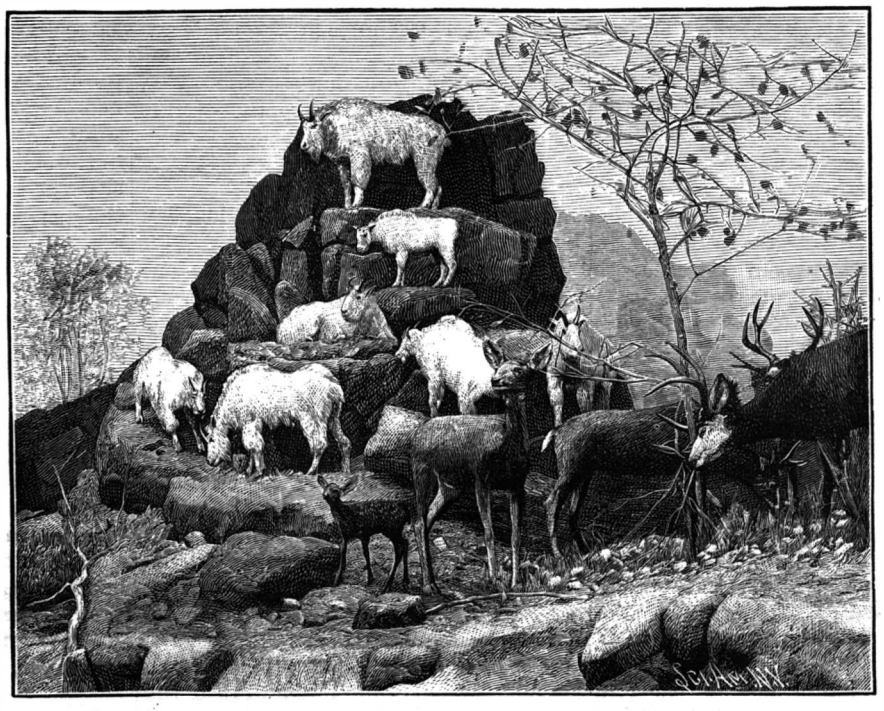
The illustrations will give the reader some idea of these triumphs of the taxidermist's art. In other parts of the exhibit the very rare moufflon, or mountain sheep, the bighorn of the trappers, is shown in great abundance and in many lifelike attitudes, as it stands upon the craggy eminence provided for it. Bears, wolves, and other characteristic specimens of the fauna of Kansas are also shown. The entire group from the point of view of the naturalist is of the highest value.

A correspondent sends us the following:

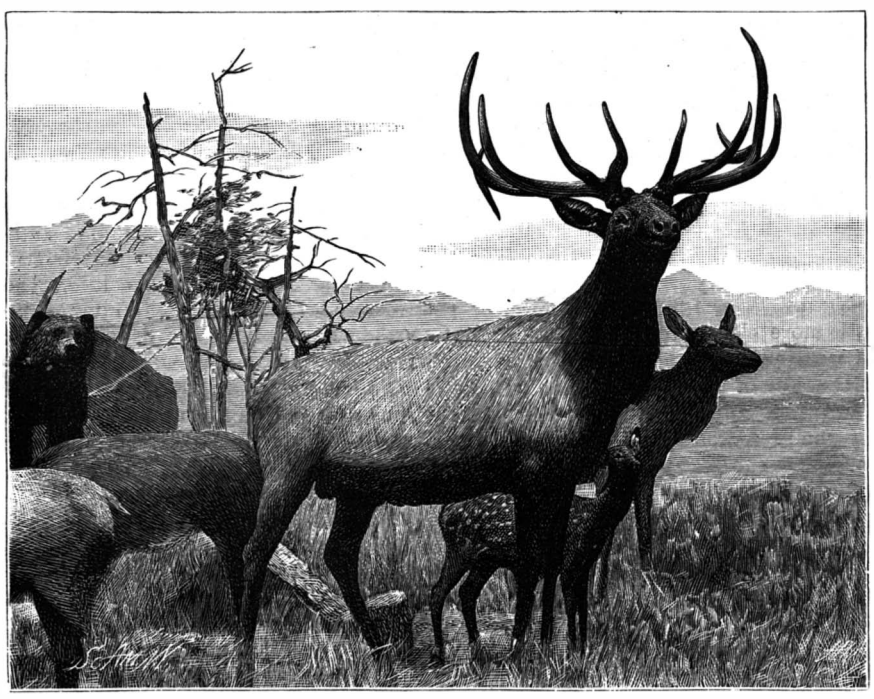
KANSAS STATE EXHIBIT OF MOUNTED ANIMALS.

In the north wing of the Kansas building is one of the most remarkable exhibits to be seen at the great Fair. I refer to the natural history display made by the Kansas University.

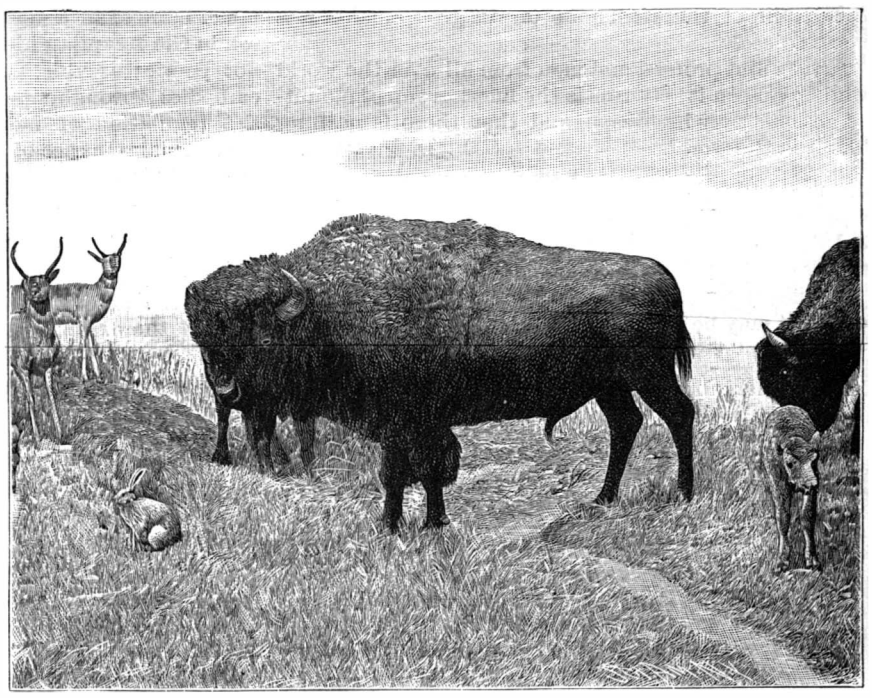
This exhibit is the work of a man who is recognized by naturalists as the best taxidermist in this country, if not in the world, and a specialty of his is the larger mammals of North America. To this branch of the study of animal nature Professor Lewis Lindsey Dyche



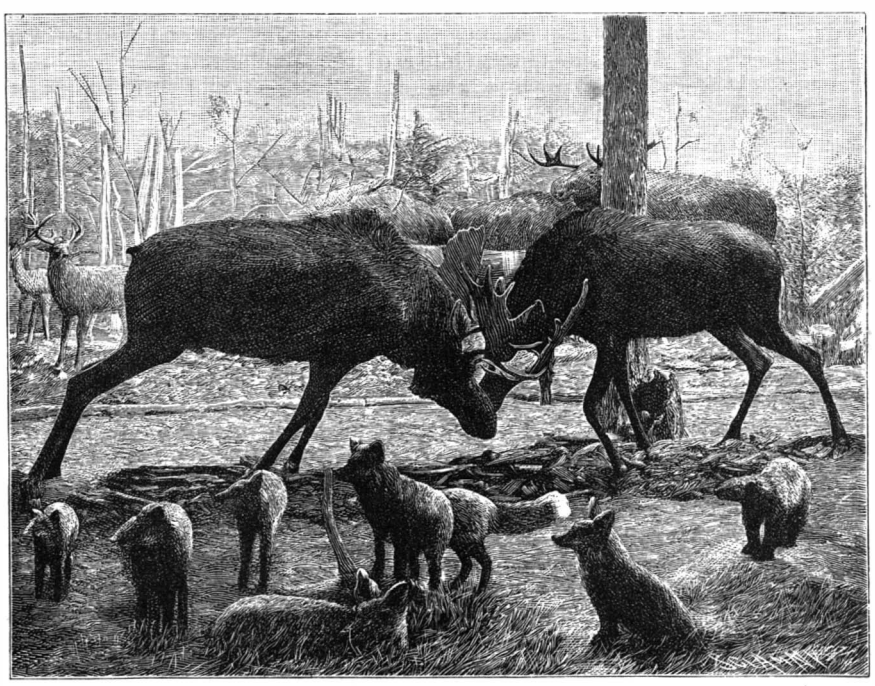
GROUP OF ROCKY MOUNTAIN GOATS.



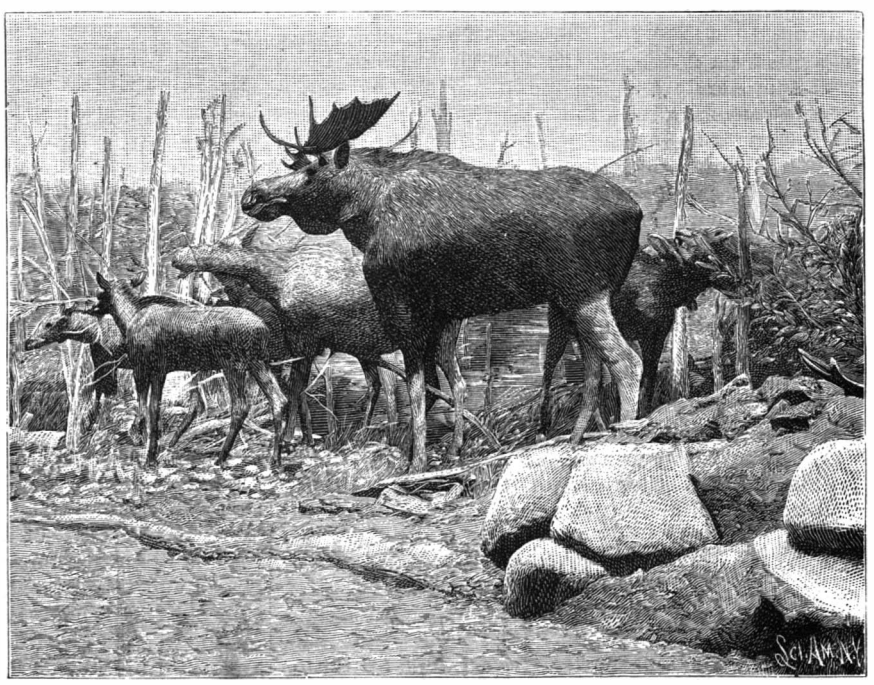
FAMILY OF ELK.



BUFFALO AND PRONGHORN ANTELOPES.



COMBAT OF MOOSE BULLS.



FAMILY OF MOOSE.

THE WORLD'S COLUMBIAN EXPOSITION—THE NATURAL HISTORY EXHIBIT FROM KANSAS.

© 1893 SCIENTIFIC AMERICAN, INC

has given many years of his life. The exhibit which he has brought to the World's Fair is the result of ten years' work in the field collecting and fourteen months' work in the taxidermic shop, with five assistants.

In this collection there are 105 mounted animals and 20 heads.

In the southwest corner of the wing will be found one of the grandest groups in the whole collection. This is a group of seven moose, shown in photographs sent. The herd is headed by an enormous bull, that stands 9 feet 2 inches from the ground to tip of his antlers. Near the bull is an old cow with twin calves. The cow is riding down a tree in order to give her calves a chance to browse the leaves.

On a little rise of ground, off from the moose, stands a herd of nine mule deer of the Rockies. On a promontory of rock above the mule deer is a group of the most remarkable animals—the Rocky Mountain goat, seen here as in his home. Under the ledge of rocks at the bottom of the craggy mountain on which are the goats is a mountain lioness and her two cubs.

On the eastern end of the wing stands another fine collection of animals, very artistic in arrangement. This is a group of six elks. The group is headed by a bull, said to be the finest ever taken from the mountains. He stands 10 feet and 9 inches from the point of his toe to the tip of his antlers.

The last group along the wall is on the extreme southeast, and is one that never fails to attract attention. It is a group of buffalo, or the American bison. An immense bull, the largest ever mounted, not excepting the famous bull in the American Museum, is the leader of this herd of five. The group is one of the most natural of the entire exhibit.

There is a group in the left center that cannot be spoken of too highly. The action is perfect, as can be seen by our cut. It is a pair of fighting bull moose. These animals are struggling hard for supremacy, and the details of the work done on the group makes it a masterpiece.

Artists and professional men from all over the world who have seen it say this is the finest group of mounted animals they have seen, and that there is nothing like it in the world. F. D. PALMER.

A Lightning Calculator.

There has arrived in London from Paris, M. Jacques Inaudi, a gentleman to whom Babbage's calculating machine would be a poor second. He gave an exhibition of his abilities recently to a small party at the Hotel Victoria, and did some vigorous ready reckoning. M. Inaudi is a little man with a pleasant face crowned by a large square forehead and ornamented with a heavy crop of upright hair and a small mustache. He has other subjects of conversation than decimal fractions and the extraction of cube roots, and does not mind in the least talking about the weather or the Panama Canal while doing complex sums. The banqueting room of the Hotel Victoria, where the *seance* was held, was reminiscent of the class room, as it contained a row of blackboards with attendant chalks. Everybody wanted to pose M. Inaudi with racking sums in all the varieties of arithmetic, but he was equal to the occasion—to half a dozen occasions, in fact—for at one time he played dominoes, found the square of a number which ran into billions, carried on a conversation in French, and announced his results in English. The names of the numerals form nearly all the English he knows. In four minutes and twenty seconds he worked out—carrying on a conversation at the same time—a sum in addition with six figures in each of six lines, a sum in subtraction running into millions, divided six millions odd by eighteen thousand odd, found the square of an eight-figure number, the cube root of one sum and the square root of another. This all was done without a figure in sight or any aid to calculation further than that afforded by occasionally resting his finger tip on the tip of his nose. What was more, he proved that the gentleman who was checking his results on the blackboard was wrong in one instance. Then, in an airy way, he recited, still without having seen a figure, every number on the blackboards behind. Here is a little sum in subtraction, which M. Inaudi worked out in less than a minute, the component numbers being dictated to him by various of the gentlemen in the room:

974,325,436,501,212,741,682,412
489,425,179,111,237,103,426,014

Result—484,900,257,389,975,638,256,398

M. Inaudi, who will shortly give a public exhibition of his powers, is a self-trained calculator, starting life when eight years old as a shepherd.—*Daily Graphic.*

Completion of the Great Dam Across the Colorado River.

A press dispatch from Austin, Texas, dated June 7, says: The regatta which began here to-day has brought together the world's greatest oarsmen and the prospects are good for fine racing during the four days it lasts. The regatta is in the nature of a celebration in honor of the completion of the great dam across the Colorado River, which is a remarkable piece of solid masonry. The length of the dam is 1,150 feet, it is 66 feet high, 60 feet broad at the base and 16 feet at the crest. It has formed a lake 22 miles long with an average width of 1,200 feet, containing 21,000,000,000 gallons of water, or enough to supply the city of Austin twenty years without being replenished. The purpose of the dam is to furnish a water supply and power for the electric light system of the city. Besides accomplishing these purposes, 14,000 horse power has been developed, which will be disposed of to manufacturers at nominal cost. The cost of the dam was over $600,000. This great work was illustrated in the SCIENTIFIC AMERICAN of September 24, 1892.

The Oldest Book in the World.

The only complete work that, without question, can lay claim to being the oldest book in the world is known as the "Papyrus Prisse," and now forms one of the treasures of the Bibliotheque Nationale. It was presented to the great library of Paris by a Frenchman of the name of Prisse, who discovered the papyrus at Thebes. The tomb in which it was found contained the mummy of one of the Entews of the eleventh, or first Theban, dynasty. The date when the manuscript was written cannot, therefore, have been later than 2500 B. C. But if the exact age of this identical copy should be doubtful, we know precisely, from the text itself, the date of its composition, as it states it was compiled by one Ptah-hotep, who lived in the reign of King Assa. The full title runs: "Precepts of the Prefect Ptah-hotep, under the King of the South and North, Assa." As this king was the last but one of the fifth dynasty, Ptah-hotep, who flourished in the reign of this Pharaoh, and held the distinguished office of "prefect," must have compiled his work about 3350 B. C. Divided into forty-four paragraphs or chapters, the work is something very much more than a mere literary curiosity. It is written in the Egyptian hieratic character; is rhythmic, if not poetic; is addressed to the educated classes and embodies throughout high and noble principles for the regulation of individual life and conduct and for the maintenance of good government. The man in authority is enjoined by this very ancient writer to labor at all times to be a true gentleman, lest from his own defects of character he suffer the authority given him by favor of the Supreme Being to be weakened. An Egyptian prefect was the highest dignitary in the land, second only in authority to Pharaoh himself. It was the office held by Joseph in the Biblical story: "Only in the throne will I be greater than thou." The prefect had the custody of the key of the Larit, or royal granaries, to which no entrance could be obtained without the production of the prefectorial seal. The holder of the office was at once the Egyptian First Lord of the Treasury, Chancellor of the Exchequer, and, in his judicial capacity, Lord Chief Justice of Egypt.

All our greatest Egyptologists bear testimony to the extraordinary civilization of ancient Egypt. The work of Ptah-hotep fully confirms this position. It testifies to a height of culture and refinement obtaining in Egyptian society 5,240 years ago that to our Western circumscribed notions of modern superiority are simply inconceivable. The teachings of the "Precepts" more than justify all that has been said by Egyptologists. "It is certain," says Professor Renouf, "that at least 3,000 years before Christ there was in Egypt a powerful and elaborately organized monarchy, enjoying a material civilization in many respects not inferior to that of Europe in the last century." Leptius writes: "The fourth dynasty ascended the throne about 3124 B. C., and at that time, long before our usual ideas of the development of nations, there is found a people highly instructed in all the arts of peace; a state carefully organized; a hierarchy firmly founded, minutely divided and organized to the smallest external matters; a universally diffused system of writing and the common use of papyrus: in short, a civilization which in all essential points has already attained its full maturity, and only by close investigation is further development in some directions discovered." So also Professor Maspero: "In one of the tombs of Gizeh, a high officer of the first period of the sixth dynasty (B. C. 3703) takes the title of 'Governor of the House of Books.' Not only was there already a literature, but this literature was sufficiently large to fill libraries, and its importance was so great that one of the court officers was specially designated for the keeping of the royal library." The wisdom and high moral teaching embodied in the precepts of Ptah-hotep abundantly confirm this testimony. This old writer urgently enforces on rulers the cultivation of the doctrine of "Ma," an Egyptian dogma, comprehending "the true, the beautiful, the good." "Ma" is the principle of order and harmony in everything; it is the steadfast pursuit of wisdom, knowledge and obedience—obedience as the best of all. Although, as in modern expression, we should say "extremely liberal" on many subjects, politically, Ptah-hotep displays an oriental horror of innovators and innovations. Ideas that may be new to the generation are not necessarily new to the world, and changes do not always imply progress.

According to Ptah-hotep, contemporary estimates of human actions are not always the most reliable or the most enduring. "Not of the counsel of the flatterers of to-day is it needful to take heed; it is of the judgment of posterity rather which renders justice to righteous actions."

"Only by a consistent life of reverence for knowledge and wisdom; by observing a just moderation in everything; not abusing authority, but by seeking to inspire love rather than fear, can we hope to appear before posterity with honor." In sixteen different instances in which Ptah-hotep speaks of God he does so in the singular number—an argument happily no longer needed to establish the monotheistic character of the Egyptian religion. He ends by saying: "I have reached one hundred and ten years of life, blessed by the favor of the king, among the first of those who have exalted themselves by their works, doing the pleasure of the king in an honored position." "The Precepts of Ptah-hotep" have been translated from the hieratic into French by M. Virey, and retranslated into English by Professor Osgood. They reveal throughout the mind of one who all his life has been accustomed to the higher walks of society in a well-ordered state. The sixteen pages of the "Precepts" are in the manuscript preceded by a few leaves of a still earlier work, written by one Kakimna, Prefect to King Seneferu, of the third dynasty. Had this work been complete, we should have been able to boast of a book older than the Pyramids and dating from 3,760 years before Christ—a book 5,650 years old!—*J. H. Mitchiner, in Knowledge for June.*

The Discovery of Lithography.

One of the greatest discoveries ever made was the result of the purest accident. It was in the year 1796. The citizens of Munich had just witnessed the first triumphant performance of Mozart's opera "Don Juan," and the theater was deserted by all save one man, Alois Senefelder, who, after making a round of inspection in the building to see that no sparks had ignited anything combustible, retired to his room to stamp the tickets of admission for the day following. When he entered his apartments he had three things in his hand—a polished whetstone which he had purchased for sharpening razors, a ticket stamp still moistened with printing ink, and a check on the treasurer of the theater for his weekly salary. As he placed the latter upon the table a gust of wind swept it high up in his room for a moment and then deposited it in a basin filled with water. Senefelder dried the wet paper as well as he could and then weighed it down with the whetstone, upon which he had before carelessly placed the printing stamp. When he returned to his room the following morning he was astonished at seeing the letters of the stamp printed with remarkable accuracy upon the dampened paper. A thought came to him. He wondered whether by some such means he could not simplify his work of continually copying the songs of the chorus. He went out and purchased a large stone, commenced making experiments, and, as we all know, finally discovered the art of printing from stone—lithography.—*Stone.*

Novel Foundation Laying.

Several novel features of construction will appear in the new building of the Manhattan Life Insurance Company, in course of erection in lower Broadway, New York. The great structure will have a steel skeleton frame, and will tower aloft to an elevation of 300 feet above the curb line. The supporting piers of the building are to be sunk to bedrock by what is known as the pneumatic process. The reason for the employment of this plan is that the soil is a fine sand for a depth of about fifty feet overlying the rock. It would be a great risk to build so heavy a structure on the sand, and to excavate to such a depth would very likely result in undermining neighboring buildings, especially as the soil is very wet. The difficulty is to be overcome by sinking pneumatic steel caissons, fifteen in number, by the same means that are often employed in laying the foundation for bridges, and which was used in connection with both towers of the Brooklyn bridge. When the caissons reach bedrock, the workmen inside level the rock, so as to give a firm bearing, and then fill in with concrete, so that the space from the top to the bottom of the caissons is solidly filled, and upon these piers in turn will be placed huge cantilevers, from which will be built up the skeleton steel structure of the building.

Bottles in China.

It is stated that the Chinese much appreciate European bottles. They have a great liking for them, and will resort to subterfuge, if necessary, to get hold of them. The common people worry the medical missionaries considerably upon this point, shamming sick in order to be supplied with a bottle of medicine. The authority for this report does not furnish any information as to what our celestial friends do with the bottles.

© 1893 SCIENTIFIC AMERICAN, INC

Chinese Cheap Labor.

American medical missionaries are now very popular in China. They are everywhere welcomed, more especially because they offer both medical advice and medicine gratis, prefaced with religious exercises. The Chinese appear to appreciate this kind of practical religion. In a recent letter to the *Missionary Herald*, Dr. Chapin tells of his missionary successes in the vicinity of Pang Chuang, and says:

"On this trip I learned for the first time that there are in this part of China a number of 'counterfeit' foreigners. I was myself taken to be one of that class, because of an ability to make myself understood in Chinese. It seems that one or more enterprising Celestials have gone into the work of dispensing medicines after the manner of the American physician. Usually two or three men go together. One of these dresses in foreign costume and talks a gibberish which is not understood by the natives, and so passes for a foreign language. In imitation of American physicians, all medicine is given away, but, unlike that fraternity, the bogus representative of America is quite willing to receive contributions of grain to feed the animal which helps convey him from village to village. In consequence grain pours in upon him by the quantity. This is disposed of by a confederate at the nearest fair, and then Ah Sin departs for 'fresh fields and pastures new.'"

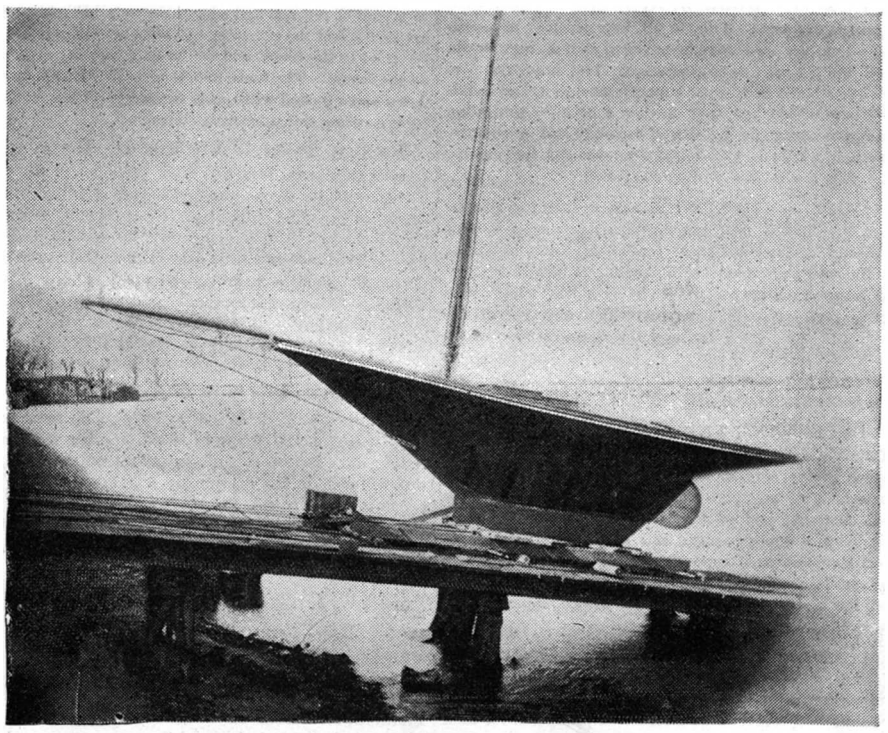
The High Atmosphere.

Beyond 29,000 feet above sea level, the height reached by Glaisher, in 1862, man has never been able to navigate the air. Various problems concerning the region farther away—such as the temperature, the pressure, the quantity of moisture, the composition of the air, etc.—have attracted the attention of physicists, and have at last led to the experiments of M. Hermite, who, during the last few months, has been sending up pilot balloons, carrying registering apparatus. These balloons are very light, with a capacity of about 100 to 200 cubic feet. Falling at distances from Paris ranging up to 200 miles, the balloons have nearly all been returned by their finders, as requested on a card attached to each, and one has brought down records from a height of 30,000 feet. The instruments used are very light and simple. With larger balloons and systematic exploration, it is hoped that the secrets of the air up to at least 40,000 feet may be made as familiar to us as those of the deepest and darkest depths of the sea are gradually becoming.

THE FIN CUTTER LENI LENEPE.

The changes and improvements which the ingenuity of modern man is constantly producing are well illustrated in the new type of sailing boats which are now rapidly coming into use. We here give a photographic portrait of the Leni Lenepe, a fin cutter, built by Clay & Torbensen, of Gloucester City, N. J., who rank among our most progressive and scientific architects, not only in the line of sailing yachts, but steam and sail craft of every description. Compared with the clumsy, round-bottomed boats of our forefathers, the new style of sailing craft here shown presents an odd and strange appearance.

The Leni Lenepe, probably, in point of construction, is the lightest fin keel cutter ever built in this country and is also one of the fastest of her class. Dimensions are 29 feet on deck and 16 feet 10 inches on L. W. L., extreme beam 6 feet 4 inches. The boat is a marvel of lightness and strength; planking is of ⅝ inch white cedar, ribs of white oak, straight grained and steam bent, 1¼ inch by 1½ inch, spaced 10 inches on centers; floor timbers are of iron, keel and deadwoods of white oak. Fin keel weighs 2,000 pounds and is bolted through keel with composition bolts. All rivets and fastenings are of brass and copper, and the method of planking is such that no calking is required; no seams are visible. The hull is finished as smooth as glass. Hull, spars and rigging weigh only 1,750 pounds. We are informed this yacht has outsailed and outpointed all boats of her class with which she has competed.



THE FIN CUTTER LENI LENEPE.

Foreign Honors to an American Architect.

Architect Richard M. Hunt, of this city, has just received at the Royal Institute of British Architects, the Queen's gold medal. Mr. Hunt is the first American on whom this honor has been bestowed. It is understood that Mr. Hunt received the medal on account of his excellent work at the Chicago Fair. Mr. Hunt has spent considerable time abroad, and much of the refined taste exhibited in his various works can be attributed to his cosmopolitan experiences.

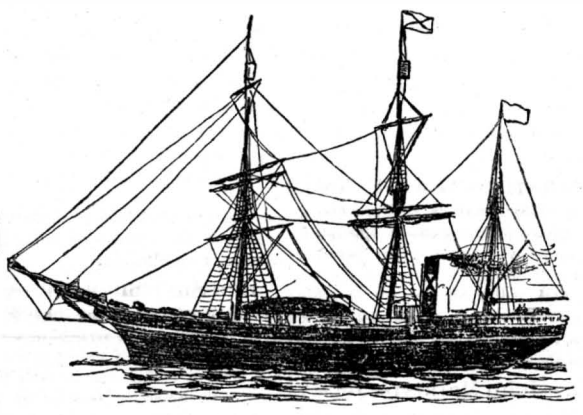
THE PEARY ARCTIC EXPEDITION.

The first chapter in the history of Lieut. Peary's new Arctic expedition was opened on the 2d of July, when the ship that is to bear him and his party to the polar regions took her departure from New York. The vessel, known as the Falcon, is a strongly built sealing steamer, belonging to St. Johns, N. F., and has been specially chartered for this service.

We give a small portrait of the ship.

The Falcon will touch at Boston, Portland—which is Lieut. Peary's old home—and at St. Johns, Newfoundland, where the crew of the vessel belongs. From St. Johns the vessel will sail direct to the Arctic seas, making the first landing at Inglefield Gulf, where Lieut. Peary will establish his station.

The Falcon is bark rigged, 162 feet long, 26 feet beam, draws 17 feet, is 311 tons burden, and has twin screws. She is strong and capable of ramming the ice. On deck she carries a steam launch and whale boats.



PEARY'S SHIP, THE FALCON.

Besides Esquimaux dogs, eight Rocky Mountain burros are carried. Lieut. Peary will teach the burros to walk on snow shoes, and they will be taken on the inland trip to carry the provisions; when their load is used up, they will be killed for food for the dogs. A cote of carrier pigeons is also taken along. Among the curiosities we saw in the cabin was Lieut. Peary's sleeping bag, which is made of the winter coat of the reindeer. The weight is 10¼ pounds, hair side inward. Lieut. Peary says he has slept in these bags in perfect comfort when the thermometer registered the very low temperature of 45° below zero F. Packed away in the hold along with the three years' provisions is the house which will be erected in Greenland and which will shelter the party for two winters. The following particulars in regard to the house were furnished the SCIENTIFIC AMERICAN by Lieut. Peary. The house will be 33 ×14 feet on the ground plan, and 7½ feet high, and will be divided into compartments. The walls of the house are divided as follows: First, an inner lining of red felt, then an air space of one inch; a sheathing of matched boards comes next, then an air space of one foot, then a layer of tarred paper; another sheathing of matched boards is followed by a layer of tarred paper; a four foot corridor comes next, and the boxes of supplies form the outer wall. The house will be heated by steam and lighted by electricity. The launch engine and boiler will be taken out of the boat when navigation closes, and will furnish steam for heating and for running the dynamo. Coal oil will be burned. Lieut. Peary's house certainly has all the modern improvements.

The Falcon will be sent back after landing the cargo and is under contract to return in the summer of 1895.

The expedition will now consist of fourteen members The list is: Lieut. and Mrs. Peary, Mrs. Cross, of Brooklyn (Mrs. Peary's maid); S. G. Entrikin, West Chester, Penn.; James W. Davidson, Austin, Minn.; E. R. Baldwin, Oswego, Kan., meteorologist; Dr. E. Vincent, F. W. Stokes, Philadelphia, artist; W. J. Swain, Indianapolis, stenographer; Hugh Lee, Meriden, Conn.; G. H. Carr, Chicago; Evraud Astrup, the Norwegian geologist; George Clarke, Brookline, Mass.; and Matthew Hanson, a colored valet.

On the east side of Inglefield Gulf, Greenland, in about latitude 78° 45′ north, 35 miles somewhat north of east of Redcliffe, Lieut. Peary has selected the site of what may be termed the headquarters of his Arctic expedition. It is 400 miles north of the most northern station now occupied in Greenland. There will be reconstructed the winter house above described, and thence Lieut. Peary will make exploring advances, and perhaps approach the north pole.

Ivorytypes.

BY GEO. G. ROCKWOOD.

Recently, in overhauling my establishment, I unearthed some ivorytypes which were made fully twenty or twenty-five years ago. They were in such a fine state of preservation, and make such beautiful and permanent pictures, I am about to revive them.

As many of the fraternity don't know how to make these pictures, I send you a description of the methods used. I think they will be a good thing to reintroduce. Many fine styles of pictures have had their "day," and have been dropped for some novelty—often, I think, unwisely. The ivorytype is one of the illustrations of this tendency. It is no step backward to make them.

Process.—First.—Make a print on plain paper, strong and brilliant; now edge a common clean glass to the width of a quarter of an inch with glue or starch; dampen your print a little and put it on the glass, picture side up. When dry, the print will be stretched nicely on the sheet of glass. The glass should be a little larger than the desired picture, for the reason that when colored and completed it is cut off from the glass. Having your print in this condition, stretched on the glass, it is to be very brilliantly colored in water colors. Altogether the picture presents a dark, strong, brilliant effect. Lay this, glass and picture, upon a flat slab of soapstone—of course, the picture side up—and gradually heat the soapstone on a gas or oil stove until the plate is hot enough to melt wax. Now break a cake of white wax (not paraffine) in two, and rub the surface of the picture with the wax, which gradually melts and saturates the picture. Your picture at this stage looks very much like a "gone goose." Now cut it very carefully at the edge with a sharp knife and lift the picture off from the glass; you will then have a translucent picture. Now heat a sheet of white *plate* glass in the same manner as you did the other, and when hot lay your wax, *face down*, upon the glass; it will soon melt and adhere to the glass. With a piece of wax (the sharp edge of the wax used as a squeegee) rub out the air bubbles. So soon as this is done, pick up your glass and let it cool. Now put drops of wax around on the picture to keep the cardboard from absolute contact with it, and put a piece of cardboard behind it, and you have the prettiest picture on earth.—*Anthony's Photo. Bulletin.*

Malaria.

Dr. H. M. Clark has printed a memoir of his experience with malaria during a residence of nine years in India. How formidable a barrier to civilization malaria is may be inferred from the fact that to this disease alone is attributable not less than half the deaths throughout the world. It is not confined to rich, low-lying soils, but is found even in sandy deserts devoid of any vegetation. Once it finds a lodgment in the system, it cannot be wholly eradicated, and it is beyond the reach of acclimatization. Only two races are proof against it, the negroes of the grain coast of Western Africa and the Taurus of Northern India. Modern medicine and sanitation are equally powerless in dealing with it.

In some places in India, where the cities and towns are built in defiance of all the rules of health, malaria never is known. As preventives, the doctor suggests the turning of swamp lands into lakes, and the planting of such trees as will retain water and shade the soil. For such purposes the eucalyptus is, therefore, useless; but the plantain and banana should answer well.

THE excavation at Hell Gate reef was attended by 21,000 soundings and 8,000 borings.

© 1893 SCIENTIFIC AMERICAN, INC

RECENTLY PATENTED INVENTIONS.

Engineering.

STEAM ENGINE. -- Elijah H. Allred, Randleman, S. C. The cylinder of this engine is supported upon an upright centrally located on a base plate near one end of which is an upright forming a pivotal point for one end of a toggle arm, while at the other end is an upright supporting a pulley and a crank from which extends inwardly another toggle arm, the inner ends of both being connected in the central upright, where they are also connected with the piston rod, the reciprocation of which operates the toggle arms to revolve the crank and driving pulley. Rods connected with the toggle arms actuate the steam and exhaust valves.

STEAM ACTUATED VALVE.—Ernest A. Menking, Pittsburg, Pa. This is a valve of simple and durable construction, designed to prevent undue wear, the main piston valve being completely balanced, so that it requires but a small amount of live steam to actuate the valve. In the cylindrical steam chest slides a main piston valve formed with four pistons in frictional contact with the interior surface of the chest, making four annular spaces in the main piston, the inlet port at all times communicating with two of the spaces, while an exhaust port is at all times in communication with one of the spaces. The valve presents various novel features, and the friction is reduced to a minimum.

LUBRICATOR.—Miles W. White, Brooklyn, N. Y. This is a simple and inexpensive device for feeding oil to high or low pressure steam engines, affording convenient and reliable means for the graduated periodical introduction of lubricating liquid into the steam chest. An oil-feeding cup taps the side of a chamber perforated at its base to receive steam pressure, while a slide block in the chamber is grooved to receive an increment of oil from the cup when in lowered adjustment, and discharge the oil under steam pressure through an aligned passage when the slide block is elevated.

Railway Appliances.

RAIL PUNCH.—Elijah B. Cornell, Philadelphia, Pa. This is a hand implement for punching the webs of rails, etc., and consists of a U-shaped frame having pivoted in the lower ends of its depending arms a transverse screw carrying a female die and a transverse slide carrying a male die, a vertical shaft extending down through the frame being connected at its lower end with the slide to operate it, while transverse and vertical screws engage the upper edge and opposite sides of the rail or bar to be punched. The entire device is very light, so that it may be conveniently carried by a workman, and by the movement of a single lever or its equivalent a hole may be made in the web.

TRAIN TABLE.—Andrew J. Culbertson, San Andreas, Cal. This is an apparatus to facilitate the making up of trains in a train yard. The main track is intersected by a transverse pit in which are mounted independent transversely reciprocating parallel tables, each having a series of tracks parallel with the main track, and adapted to align with it, and each of a length to receive a single car, whereby a whole train may be made up by a single shifting of the respective tables. Each table has a piston and cylinder, the latter connected with a fluid pressure supply pipe, whereby power may be readily applied to slide the table in either direction.

AUXILIARY CAR MOTOR.—William H. Schollioll, Chester, Pa. This is a spring motor to be connected with any car axle, and especially adapted for use on cable cars, to enable the cars to cross another cable, or to change from one cable to another, or to a side track, or it may be used on electric cars where the circuit is broken. The spring is wound up by the movement of the car, and automatic means are provided for throwing it out of gear with the axle when fully wound up. Provision is also made for the prevention of any breakage on account of the negligence of gripman or cableman. The spring is designed to be strong enough to move the car some little distance, and obviate the necessity of employing horses for making such transfers as animal power is sometimes employed for on cable or electric roads.

Mechanical.

BOILER FLUE EXPANDER. — Leopold Biddle, Raton, New Mexico. This is a roller expander in which the roller casing is formed with an apertured end and provided with longitudinal slots to receive the rollers, an apertured cap screwing in the head of the casing abutting against the ends of the rollers to hold them in place within the casing and to take up the strain. The device is of simple and durable construction and is arranged to reduce the wear and tear of the tool to a minimum.

MACHINE FOR FORMING ORNAMENTS. —Louis A. Eucker, Hoboken, N. J. This machine is designed primarily to mould ornaments from glass or other substance, either pliable when cold or when heated, and secure to the ornaments at the time they are formed a shank of wire or other material, cutting the shank to the proper length. Combined with dies, one of which is movable toward and from the other, is a clamp for holding the wire carrying the material to be acted upon by the dies, and means for operating the clamp from the movable die. The machine is designed to make cleaner and quicker work than heretofore possible, as the dies or moulds are nearer the fire and well above and at one side of the table of the machine, enabling the operator at all times to conveniently note the progress of the work.

Agricultural.

PLOW.—John T. Lucas, Centerville, Washington. This is a gang or cultivator plow, the frame of which is of strong and simple construction, and permits of the shares being quickly and conveniently attached and readily reversed. Means are provided for regulating the depth that the shares shall enter the ground, and the rear or guard wheel may be locked to travel in a straight line only, or be unlocked so that it will have a swivel connection with the frame, thus enabling the implement to be turned around square corners or squarely around. The shares may be readily elevated from the ground when the plow is to be taken away from the field.

CORN HUSKING MACHINE.—Augustus Smith, Scotland, South Dakota. A machine which snaps the corn from the stalk and then rapidly and effectively husks it has been devised by this inventor. A gatherer and separator mechanism is supported at the front end of a main frame carried on wheels, there being husking devices at the rear end of the frame, and the two being connected by an elevator which carries the separated corn ears to the husker. The husking mechanism comprises an open bottom trough-like chamber with side walls formed of corrugated rollers arranged longitudinally and in a plane parallel to the feed. The husked ears are discharged into a box on the under side of the husker.

Miscellaneous.

DUMPING BUCKET.—James A. Quinn, Brooklyn, N. Y. The scoop sections of this bucket are united by a pivot bolt surrounded by rings connected with the sections by chains of a length calculated to maintain the rings out of engagement with the bolt when upward tension is exerted, so that when the bucket is elevated no strain is brought upon the pivot bolt, and the sections may be opened and closed with equal facility under all conditions.

DUSTING APPARATUS.—Lewis F. Neal, Waltham, Mass. A revoluble brush is held in a casing attached to a hose connected with an exhaust apparatus, the casing containing also a wind or fan wheel operating the brush by the air drawn through to the exhaust apparatus. The device is designed to stir up dust or other matter and draw it away by suction, and it may also be used for brushing furs, fabrics, and the like, or for removing dandruff from the head, etc.

PIPE FITTING.—John McIntyre, Jersey City, N. J. A coupling has a threaded connection with a follower provided with a second thread adapted to be engaged by the pipe to be coupled, while a packing ring having an interior and exterior screw thread is arranged between the coupling and follower, so that the latter on being screwed up compresses the packing ring on the coupling and the pipe to be coupled. The packing ring is compressible, and has screw threads engaging simultaneously the screw threads on the follower or the coupling and that of the pipe.

EXTENSION TABLE.—Achilles R. Stebbins, Watsontown, Pa. A substantial and durable table which may be made into a variety of sizes and shapes to fit in any desired part of a room, or to conform in size and shape to the necessities of a family, has been provided by this inventor. It has extensible wings at right angles to each other, folding supports extending from the outer end of one wing to the outer end of the other, the supports folding in the middle and having a central leg, and the supports carrying supplemental leaves between the wings. The invention also covers various other novel features.

STEP LADDER AND BENCH.—Ensign B. Stebbins, Lake View, Mich. This is a combination household article, the bench being adapted to support wash tubs and other articles, while the step ladder formed is very solid and stable, the change being readily and conveniently made from one to the other.

PENCIL.—John J. Gillespie, Colorado Springs, Colorado. This is an improvement in pencils in which the lead may be adjusted as it is worn down, and will not have to be sharpened. The improved pencil has a bored body with a longitudinal slot, and a slide or sleeve within the bore having a laterally projecting clamp to engage the interior of the body and prevent retraction, with an extension through the slot for moving the slide toward the point of the pencil.

BOTTLE CORKING TOOL.—Karl Kirschner, Jr., Radlic, near Prague, Austria-Hungary. This inventor has provided a tool for lead stamping or sealing bottle corks, provided with punching surfaces adapted to impress marks on the ends of a lead wire, with a gauge plate on one side against which one end of the lead wire abuts and a knife on the opposite side which cuts off a suitable length of the wire. A lead stamp or steel may thus be affixed which will surely indicate when the bottle has been opened.

LACE FASTENER.—Alexander Klinger, Telluride, Col. This invention relates to fasteners for shoes, gloves, corsets, bags, etc., in which two disks or buttons lying near each other serve to hold by friction the fastening end of the lace. The device is mainly made up of upper or outer and lower or inner buttons corrugated on their approximate faces, a central square or angular post between them, and crossing bar springs on the under or back side of the device, applied to the post.

CABLE PROTECTOR.—Albert W. Lackey, Gold Hill, Nevada. Metallic cables used in mines for raising buckets, propelling cars, etc., are, according to this invention, afforded a protection for their surfaces consisting of a staple whose two prongs are to be driven into the cable, and having a large concave head adapted to fit snugly on a strand of the cable. A series of these staples is driven into the cable, and their heads prevent the rubbing of the cable itself on the flanges of the pulleys or drums over which the cable passes.

PRESERVING FRUITS, ETC.—Milledge B. Wever, San Antonio, Fla. The preserving of citrous fruits, such as oranges, lemons, limes, and grape fruit, and also fruit and vegetables containing a trace of silica, as the apple, cucumber, egg plant, etc., are especially contemplated by this improved method, which provides a means by which they may be kept perfectly fresh for a long time, as to taste, smell, and color. The method consists in packing the fruit in an air-tight box between layers of oiled cotton batting, and covering the contents of the box with a sheet of rubber. The box should have an orifice in one side to allow of escape of moisture after packing, after which the opening may be closed by wax or a suitable seal.

FAN ATTACHMENT.—George W. Grimes, Murfreesborough, N. C. This improvement provides a means of operating a fan by a rocking chair, to fan a person in the chair or one lying in a bed. The fan is suspended by means of a hanger from a bracket secured to the ceiling, and the fan is connected by a cord with a spring bar on the back of the chair, the rocking of the chair then vibrating the fan back and forth. The hanger can be placed at any desired location, and may be readily adjusted as to height.

BICYCLE SADDLE.—Edward S. Cross, Elyria, Ohio. This is a simple and inexpensive saddle in which the spring is formed of a forward and rearward section, arranged to overlap, and held to adjusted positions by a single clip device, which is also adapted to be attached to the seat bar. The arrangement is such that the forward spring reinforces the rear spring against any unusual strain.

CLOTHES POUNDER.—George W. Ainsworth, Montpelier, Vt. This pounder has on the lower end of its handle an outer inverted funnel, within which is an inner funnel or convex disk, the funnel and disk each having numerous perforations, and both being connected by the handle. The arrangement of the funnels is designed to facilitate the quick cleansing of the clothes by the pounder, without danger of tearing them.

SHAFT TUG.—William F. Sweet, Webb's Mills, N. Y. This tug is so made that its inner or wearing surface may be readily changed in position, presenting fresh portions of the leather to the friction of the shafts or thills. The tug strap is adjustable in length to adapt it for any size of thill, and by means of the improvement a much longer use than usual of the tug strap is attained, the surfaces becoming worn being moved out of contact with the shaft.

BED SLAT SUPPORT.—George Luppert, Williamsport, Pa. A slat-supporting bar on the side rail is, by this improvement, held in a series of spring supports, each formed of a stout wire bent to form a wide bail with a spring coil in each vertical portion, and a hook at the upper end to enter the rail. With this support the slats can be quickly placed in position, their accidental displacement is almost entirely avoided, and the resilient properties of the springs are uniformly distributed over the entire bottom.

AXLE NUT. — Joseph Bermel, Middle Village, N. Y. This invention relates to an improvement on a formerly patented invention of the same inventor, providing a nut which may be quickly and conveniently locked upon the axle without the locking mechanism being seen. The interlocking portions of the axle and the nut are so shaped that the two may be quickly engaged and disengaged, and when brought into locking position they cannot be accidentally separated.

BATH.—George Elliott, New York City. This is an improvement in portable cabinet baths in which a pump is located in a water-holding receptacle at the bottom, and operated by the occupant of the bath to force water into spray pipes in its upper portion. The casing is preferably made in two sections united by water-tight connections, and by working the pump lever the water is forced into a dome, flowing from thence to various pipes which afford top and cross sprays, as well as through two flexible spray pipes for use as desired.

PORTABLE FENCE. — Henry Knee, Kent, Pa. This is a portable and reversible fence, with batten strips and cross bars, and swiveling eye bolts connecting the horizontal bars to the end posts pivotally, to permit of reversal and adaptation to a hill side. Tie hooks connect the swiveling eye bolts on the outside of the bend in the fence, and the locking bars are arranged on the inside. The fence panels may be turned upside down and adjusted with equal facility in either way to form a strong and substantial fence.

FENCE POST.—William H. Hunt and Charles O. Morris, Trenton, N. J. This post is made of T-iron, with its shank member having a series of recesses in its outer edge, each recess having an upper curved channel extending downwardly and inwardly, a lower curved section meeting the channel and extending diagonally beneath it, while spurs are formed in the channels. The post is especially adapted for use as an intermediate post in building wire fences, and is very light and durable, and may be readily driven into the ground.

PETROLEUM CASK.—John D. Sprunt, London, England. This is a non-collapsible receptacle, consisting of a rigid frame of wood or other light material, with a flexible side of parchment or glued paper that will yield to the contraction and expansion of the contents of the vessel, the surfaces being coated with glue to close the joints and render the material impervious. There is an aperture for filling and discharging in combination with a collapsible funnel. The receptacle is especially suited for liquids of a penetrating nature.

Designs.

EMBROIDERY FABRIC. — Julius Frelloehr, New York City. Braids or strips form the background of this design, and they are ornamented on top with a raised network of individual threads in zigzag line, the crossing angles forming small figures.

SPOON.—Charles Otero, Pueblo, Col. The handle of this spoon represents a hammer around which is draped a flag, the end having a medallion female portrait on one side and on the other a mountain view, while in the bowl is a representation of the Colorado mineral palace casket.

SPOON.—Charles Barclay, Lead, South Dakota. The handle of this spoon has on its outer end a marine view, with a sailing vessel and rising sun, while in the foreground is the figure of an Indian as if watching the vessel.

COVERED DISH.—Robert L. Johnson, Hanley, England. This dish is elongated and has a flattened base, and at its ends are outwardly curved handles ornamented with leaf-like scrolls, the cover fitting between the handles and its edges overhanging the sides of the dish. The edges and knob of the cover have scroll-like ornamentations.

SHOW STAND. — Allben L. Yearous, Eagle Grove, Iowa. Upon a suitable base is a post having marked divisions of decreasing size separated by cylindrical portions from which radiate arms, each arm carrying a series of pendent hook-like figures.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

COMMON SENSE HEALTH NOTES. By A. R. Horne, D.D. Chicago: A. Flanagan. 1893. 12mo. Pp. v, 305.

Contains many useful suggestions for realizing and then maintaining good health.

NAPOLEON: A DRAMA. By Richmond Sheffield Dement. Chicago: Knight, Leonard & Co.

The author has sought here to portray some of the leading spectacles of Napoleon's life in a form suitable for scenic representation and acting on the stage. A work so ambitious would be really a very great accomplishment, if successfully carried out, but its success on the stage is yet to be achieved.

The Peter Adams Company, of New York City, manufacturers of American art papers, have just issued a beautiful volume of specimens of their different kinds of paper, with artistic printing of various classes on the special kinds and qualities of paper made for each class of work. Printers and publishers getting out fine work will do well to examine these specimens.

"The Book of the Fair," of which Part I. has just been published by the Bancroft Company, of Chicago and San Francisco, promises to be one of the richest and completest of the many more or less elaborate publications projected in this field. It is a large quarto, on heavy calendered paper, of a quality well adapted to bring out the details of the many half-tone and other engravings with which its pages are richly embellished, and the text is in fine, large, beautiful print, with generous margins. It is designed to be "in the strictest sense a work of art, as well as of material and moral instruction," and the reputation of its author, Mr. Hubert Howe Bancroft, affords a good guaranty that it will well come up to such promise. The parts are furnished at one dollar each.

SCIENTIFIC AMERICAN BUILDING EDITION.

JULY, 1893.—(No. 93.)

TABLE OF CONTENTS.

1. Elegant plate in colors, showing the handsome residence of S. E. Walton, Esq., at Springfield, Mass., at a cost of $10,000 complete. Floor plans and perspective elevations. A pleasing design.
2. Plate in colors showing the residence of Wm. H. Fitzgerald at Bridgeport, Conn., erected at a cost of $6,000 complete. Two perspective views and floor plans. J. W. Northrop, Esq., architect, Bridgeport, Conn. An attractive design.
3. A dwelling recently erected at Chester Hill, N. Y. Perspective view and floor plans. A model design. Cost $6,850 complete. Messrs. Munn & Co., New York City.
4. A Colonial modern dwelling recently erected at Montclair, N. J., at a cost of $5,500 complete. Floor plans, two perspective views, etc. Messrs. Munn & Co., architects, New York. An excellent design.
5. Engraving and floor plans of two designs of cottages recently erected for Mr. D. H. McKay, at Boston, Mass., at a cost of about $1,600. A. W. Pease, architect, Boston, Mass.
6. Floor plans and engravings of a stone residence erected for George W. Childs, Esq., at St. David, Pa. A very attractive design. Cost $7,600 complete. Messrs. F. L. & W. L. Price, architects, Philadelphia, Pa.
7. An old colonial style dwelling at Belle Haven, Conn. Floor plans and prospective elevations. A picturesque design.
8. A residence at Belle Haven, Conn. A unique design. Perspective elevation and floor plans. Messrs. Boring, Tilton & Mellin, architects, New York City.
9. Bird's-eye view of the World's Columbian Exposition —looking West.
10. The Fifth Avenue Theater, New York.—View showing the orchestra chairs and seating arrangement. Mr. Francis H. Kimball, architect, New York.
11. Miscellaneous contents: A change in name.—A tufted metal ceiling, illustrated.—Hanlon's anto matic boiler feed, illustrated.—Simple means of raising water to house tanks, illustrated.—Copper statue, "Flying Dutchman," at the Columbian Exposition, illustrated.—Naphthalene as a timber preservative.—Ornamental parquetry floors and borders, illustrated. — An improved wood working machine, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers.

MUNN & CO., PUBLISHERS,
361 Broadway, New York.

© 1893 SCIENTIFIC AMERICAN, INC

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Order pattern letters & figures from the largest variety. H. W. Knight & Son, Seneca Falls, N.Y., drawer 1115.

"U. S." metal polish. Indianapolis. Samples free.

Kemp's Manure Spreader, Syracuse, N. Y. See Adv.

Bankrupt Machinery Sales. Am. Tool W'ks, Clev., O.

Chain Belting & Grain Dryers, F. H. C. Mey, Buffalo, N.Y.

Hoadley Portable Engines.
Geo. T. McLauthlin & Co., 120 Fulton St., Boston, Mass.

Universal and Centrifugal Grinding Machines.
Pedrick & Ayer, Philadelphia, Pa.

Handle turning machinery. Trevor Mfg. Co., Lockport, N. Y.

Wm. Jessop & Sons have a handsome display of steel in Mining building at the World's Fair.

Manufacturers who wish to manufacture a new style ax, address Frank X. Schuster, Raber, Mich.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hydraulic Wheel Presses a specialty. The J. T. Schaffer Mfg. Co., Rochester, N. Y. See adv. page 399.

Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 30.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps for paper and pulp mills. Irrigating and sand pumping plants. Irvin Van Wie, Syracuse, N. Y.

Guild & Garrison, Brooklyn N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Split Pulleys at Low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Perforated Metals of *all* kinds and for *all* purposes, general or *special*. Address, stating requirements The Harrington & King Perforating Co., Chicago.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

Canning machinery outfits complete, oil burners for solde ng, air pumps, can wipers, can testers, labeling machines. Presses and dies. Burt Mfg. Co., Rochester, N. Y.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

☞ Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(5176) W. H. B. writes: I have several pieces of steel in the form of horseshoes. How shall I proceed to magnetize them to get the best results? I have access to dynamos, batteries, etc. How should steel be tempered for magnets? A. Heat the polar extremities of the horseshoe to a red heat. Harden them by cooling in water, draw the temper to a dark straw color verging on a purple, and if the poles of the field magnet of the dynamo are near enough together to allow the poles of the horseshoe to rest one upon each of the dynamo poles, all that is necessary in order to magnetize your horseshoes is to place them in contact with the poles; but if the poles of the dynamo are too widely separated for this, you can apply one pole of the horseshoe to one pole of the field magnet and the other pole of the horseshoe to the other pole of the field magnet.

(5177) F. H. T. asks: 1. On page 407 of your Cyclopedia, No. 14 of hydro-developer, I find this receipt: Sulphite of soda, cryst. soda, and distilled water. Now what is meant by cryst. soda? A. Cryst. soda means crystallized sodium carbonate (washing soda). 2. I also notice in several places you say neutralize with different chemicals. I would like to know how the process of neutralizing is done, *i. e.*, to know when enough of the neutralizing chemical has been put in? A. To neutralize is to add acid or alkali to a solution as required until it is neither acid nor alkaline. Acid is added to neutralize an alkaline solution, and *vice versa*. Litmus paper may be used to determine neutrality. 3. How can I make litmus paper? I cannot buy it here, and how long will it keep? A. See page 371 of the Cyclopedia. Litmus paper will last a long time if kept out of strong light.

(5178) T. H. DeS. asks: 1. Will you kindly tell me how to make a spark coil? I am putting up in my bedroom an automatic electric gas burner and want spark coil for igniting gas. Kindly state of what the core should be made. A. No. 18; or No. 20 soft annealed iron wire. 2. Name diameter and length. A. ¾ of an inch in diameter and 8 inches long. 3. What number (Am. w. gauge) of cotton-covered wire should the core be wound with? A. No. 18. 4. State the quantity of wire required for winding. A. Use enough of the magnet wire to make the depth of the winding about equal to the diameter of the core. This will probably require about 2 pounds.

(5179) H. K. asks: Can you tell me of any process by which copper can be melted in a crucible and poured in sand moulds, and then taken after they have become cold and heated to a red heat in a forge and forged out on an anvil. I have tried to cast some soldering coppers and, upon forging them, they would all crack to pieces. I used best lake copper fluxed with about 1 per cent of aluminum, and casting without this flux they would become porous and unfit for use. A. There should be no difficulty in forging good copper. The aluminum tends to harden the copper and may be the cause of the difficulty in forging. Soldering coppers are usually forged from rolled copper rods. By making the castings of the proper shape, forging may not be needed. Try casting the coppers with 1 per cent of tin instead of aluminum.

(5180) W. H. R. asks: If you had a cell of battery giving say 10 amperes and 100 ampere hours working a motor, would it last longer if the motor had a resistance of 1 ohm or 3 ohms? A. By increasing the resistance of your motor, you would be able to run it for a longer time, though with less power.

(5181) E. E.—The latest observations concerning the newly descovered fifth satellite of Jupiter show that the little world is about 100 miles in diameter and 67,000 miles distant from the surface of its great king and father.

(5182) T. D. M. writes: We have a marble-topped sideboard on which some Horsford's acid phosphate has been spilled, turning the dark red stone a white color. Can you recommend something to restore the color? A. Try washing the stone with soda or some other alkali, stain with dragon's blood dissolved in benzine, and repolish. Your restoration will probably be very imperfect.

(5183) S. D. L., Jr.—The method of cutting down trees by means of electrically heated wire has proved a failure for the reason that the ashes accumulating in front of the wire prevent the wire from coming into contact with the wood.

(5184) W. H. C. asks: 1. Is a gravity cell suitable for running induction coil? A. No. 2. Would iron (or steel) wire do for the secondary coil? A. No. 3. Does the primary coil or the electro-magnet induce the current? A. Both.

(5185) C. C. F. asks: About what degree of heat is produced when the gauge shows 60 pounds pressure of a boiler? I mean the dry steam. A. Steam at 60 pounds pressure has a temperature of 307° Fah.

(5186) G. L. F. writes: I have some wild plum trees that become badly infested with worms every summer. The worms spin a web which soon covers the entire tree, spoiling leaves and fruit. Is there anything which will rid the trees of the worms and not injure the fruit for eating? Have tried a solution of insect powder, also slaked lime, without effect. A. Reply by Professor C. V. Riley.—Without seeing specimens of the worms described it would be difficult to give a specific determination, but from the description the insect is evidently either one of the tent caterpillars (*Clisiocampa spp.*) or the common fall web worm (*Hyphantria cunea*). If the former, one of the best preventives is to cut off, during the winter time when the trees are bare, the egg masses which encircle the twigs and which are readily visible. At this time of the year, however, the best remedy will be to destroy the nestwhen it first appears, either by pruning it off and burning or by burning upon the tree by means of a mop saturated with coal tar and ignited, or a brick soaked in kerosene, fastened to a pole and ignited, which will answer admirably for this work. If this method is neglected until later in the season, when the nests have spread over larger branches, one of the quickest methods of treating a large number of trees or an orchard is to thoroughly spray with Paris green water in the proportion of a quarter of a pound of the poison to about 50 gallons of water. I have received many complaints the present year of the inefficacy of Paris green sprays, and have no doubt that in the great majority of instances this is due to an inferior article of Paris green, and every one using this arsenical should be careful to have the samples tested, so as to make sure that they are not so thoroughly adulterated as to be practically useless.

(5187) A. W. P. writes: The writer, with others, in passing through Delaware and Raritan Canal recently, was led into a discussion as to the cause of the peculiar action of water on the banks. The swell from the boat rose about two feet above usual water level, and was preceded by a depression in the water of about the same, that is, the water at sides of canal from a point about opposite the bow of the boat sank down two feet, and was followed by the swell of two feet about opposite stern of boat. It is plain that the displacement would cause the swell, but what caused the water to sink two feet below the usual level? Was it the action of the propeller drawing the water back? If not, what? The boat was a small tug, 60 or 80 feet long. Canal 80 feet wide, speed 6 to 8 miles per hour. A. The preceding wave, side depression and following wave is produced in shallow and narrow channels, as in canals, by the inability of the water to move around the boat from bow to stern in the proper time corresponding with the speed of the boat; hence a wave is produced ahead of the boat and a corresponding depression at the side. This condition causes the water to flow backward past the boat with considerable velocity, meeting the wave following the boat and raising the crest that washes the banks. The propeller favors this action somewhat, but all boats when towing in a canal at considerable speed produce a bank wash by the retardation in the current to meet the displacement of the moving boat. Unless there is a depression from the bow toward the stern, the water could not flow toward the stern, as it flows by gravity. The depression is the hydraulic gradient that produces the flow, and its velocity bears a relation to the speed of the boat and the relative sectional areas of the canal and boat. The same effect may be noticed with all vessels under speed in open waters, but the limited sectional area of a canal greatly increases the wave height.

(5188) F. C. writes: Please tell me through your paper whether you would advise me to use saw dust for a filling (between heavy siding and plaster) in place of paper and sheathing in order to cheapen the cost in building a house. A. We cannot under any circumstances advise the use of saw dust as filling in a dwelling. It cannot be put next the plaster until the plaster is set, which will be inconvenient in practice, and to put in a board lining behind the plaster would be expensive. There is also danger from a mass of sawdust in the walls of a building. Accidental wetting of the sawdust makes it liable to heat, and spontaneous combustion has often taken place in moist saw dust. Our advice is to use what has been the result of experience in wooden house construction, viz., close studding, diagonal sheathing with good stiff paper inside and outside the sheathing, and covered with clapboards, shingles or matched siding to suit the required style or taste. It will pay in the end in your climate.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 4, 1893,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Abdominal supporter, A. B. S. Phillips 500,609
Acid, making nitric, C. O. Volz 500,786
Adding device and register, T. J. Lockwood 500,919
Advertising apparatus, T. Obbinson 500,939
Advertising device, G. Mann 501,015
Advertising valise, Long & Dimick 501,013
Air brake, A. P. Massey 501,016
Air brake, automatic, W. Keywood 500,910
Air compressor, C. Quast 501,046
Air motor, J. P. Foulks 500,877
Alarm. See High or low water alarm.
Ammonium nitrate making, J. Landin 500,914
Animal boot, L. H. Smalley 500,968
Antiseptic compound, L. H. Baekeland 500,549
Apartment ventilator, J. Fransmann 500,880
Apparel fastener, wearing, T. Heintz 500,893
Armature, ring, C. W. Jefferson 500,902
Awning frame, H. Giessenbier 500,741
Ballot boxes, canceling and register actuating device for, W. T. Butler 500,850
Band cutter and feeder, E. S. Wilhite (r) 11,349
Bandage, water, G. F. Ellis 500,568
Bank notes or other currency, press for packing, W. F. Hess 500,766
Bar. See Metal bar.
Basket, splint laundry, G. H. Carlson 500,991
Bath. See Turkish bath.
Bathtubs, device for heating water in, B. W. Felthousen 500,802
Battery. See Secondary battery. Secondary electric battery.
Bed bottom, A. W. Day 500,865
Bed, sofa, P. F. Asker 500,792
Bedstead, J. J. Dugan 500,867
Bedstead, invalid, A. J. Goodwin 501,006
Bell, E. D. Rockwell 500,951
Bending press, S. Swartz 500,974
Berry picker, C. C. Read 500,613
Bicycle, V. H. Nulle 500,938
Bit. See Bridle bit.
Blotting pad, J. C. Moginie 500,774
Boat. See Ice boat.
Boiler. See Locomotive boiler. Steam boiler.
Boiler, B. J. Coller 500,855
Boiler, C. R. Moore 500,814
Boiler furnace, steam, C. Rinck 500,777
Bolt cutter, L. S. Grossman 500,887
Bone cutting machine, J. E. Wilson 500,986
Book for pad, memorandum, G. W. Brown 500,736
Bookbinder, N. D. Wolfard 500,833
Bottle stopper attachment, ink, G. R. Weed 500,962
Bottles, stopping stopper for, G. Hartwig 500,632
Bottling apparatus, M. E. Donally 500,866
Box. See Journal box.
Braiding machine, A. Bayler 500,685
Brake. See Air brake. Car brake. Gun carriage brake. Pulley brake. Railway rail brake.
Brick, device for protecting unburned, Schlegel & Mayer 500,620
Bridge, draw, Turner & Warner 500,633
Bridge gate, Haberthur & Mandel 500,654
Bridges, apparatus for recording the flexure of, E. Parenthou 500,775
Bridle bit, W. C. Wittmann 500,831
Brush, S. Palmer 500,719
Buckle, Derrick & Moore 500,705
Buckle, blanket, F. J. Herrick 500,894
Buckle, wire, C. R. Harris 500,764
Burial casket, J. A. Lakin 500,809
Burner. See Gas burner.
Bust form, E. & A. Merle 500,926
Button shanks and fasteners, machine for connecting, E. Christensen 500,993
Cable releasing device and crossing, A. Jeffreys 500,903
Cake machine, S. L. Hall 500,655
Camera. See Magazine camera.
Can labeling machine, W. A. & F. M. Dunn 500,566
Car bolster, C. T. Westlake 500,989
Car brake, J. T. Duff 500,649
Car brake, A. P. Massey 501,017
Car brake, F. Roediger 500,952
Car brakes, hand shaft for, J. H. Surtin 501,031
Car coupling, F. Anderson 500,731
Car coupling, C. Halpin 500,890
Car coupling, Munton & Frazier 500,815
Car coupling, B. F. Sheldon 500,961
Car coupling, J. L. Sowell 500,624
Car coupling, F. Vaughan 500,981
Car deflector and ventilator, passenger, C. E. Berry 500,555
Car equalizing device, J. Gosney 500,573
Car gong, J. H. Surtin 501,030
Car, hopper bottom, R. Blackstone 500,846
Car, log, L. T. Johnson 500,712
Car, street, J. Marshall 500,924
Car unloader, A. Dahl 500,997
Cars in mines, handling coal, J. A. Anderson 500,547
Carbon trimming machine, C. O. Bartlett 500,553
Carbureting apparatus, S. Marcus 500,772
Carpet sweeper, C. Tangenberg 500,976
Carriage body, L. Doyle 500,740
Carriage top, M. D. Martin 500,925
Carrier. See Package carrier. Water carrier.
Cash carrier apparatus, H. M. Weaver 500,642
Cash carrier apparatus, S. W. Barr 500,552
Cash register, H. W. Hoffheimer 500,898
Casket top fastener, S. N. Hiser 500,577
Casting teeth on gear wheels, chill mould for, S. E. Maxwell 500,591
Cattle guard, B. Wolhaupter 500,730
Ceiling, metallic, C. C. Moore 500,595
Cement pipes, apparatus for the manufacture of repressed, C. Schnell 500,675
Centrifugal machine, Von Szczeniowski & Von Piontkowski 500,782
Chains, means for propelling, C. W. Hunt 500,807
Chair. See Folding chair. Rail chair. Railway rail chair.
Chimney or smokestack, R. Savage 500,779
Chopper. See Cotton chopper. Vegetable chopper.
Chuck, nipple, L. M. Saunders 500,320
Churn, I. S. & W. O. Bunker 500,990
Churn, J. L. Cutter 500,859
Cigar glossing device, O. Stroberger 500,823
Cigar holder, J. Anderssen 500,791
Clamps, die for forming metallic, O. C. Rumsey 500,618
Clasp. See Veil clasp.
Cleaner. See Track cleaner.
Clock, geographical, A. G. Jourdan 500,659
Clock, ship's bell, J. S. Negus 500,717
Clock scouring machine, J. W. Steelbrooke 500,626
Clock striking mechanism, E. O. Caccialupi 500,704
Clock winding mechanism, D. Vauthier 500,683
Clothes pin, H. C. Griffin 500,574
Clothes wringer, C. Wheeler, Jr 500,984
Coin receiver or tray, W. A. Rusk 500,955
Coin registering receptacle, E. A. Jahncke 500,769
Coke oven, regenerative, F. Westermann 500,684
Collar and necktie, combined shirt, B. Lowenberg 500,921
Collar fastener, adjustable, J. V. Washburne 500,640
Condenser, Abbott & Redstone 500,701
Cooler. See Water cooler.
Copy holder, N. G. Leslie 500,715
Corset stiffener, D. H. Warner 500,638
Cotton chopper and scraper, W. A. Talley 500,979
Cotton conveyers, mechanism for automatically operating the air or cut-off valves of pneumatic seed, F. C. Gammons 500,804
Cotton gin saw, W. M. Brown 500,560
Cotton, treating, H. Anthoni 500,732
Coupling. See Car coupling. Hame coupling. Hose coupling. Thill coupling.
Cream separator, J. J. Berrigan 501,039
Creamer, centrifugal, J. J. Berrigan 501,040
Creamer, centrifugal, N. G. Williams 500,787
Crimping machine, W. E. Frost 501,044
Crushing machine, R. McCully ..... 500,596 to 500,598
Cultivator, C. Aulsber 500,842
Cultivator, D. E. Barton 500,702
Cultivator, C. T. Eldredge 500,873
Cultivator, wheel, E. A. Couch 500,799
Currents, method of and means for producing alternating, E. Thomson 500,630
Cut-out, safety, O. Offrell 500,601
Cutter. See Band cutter. Bolt cutter. Weed cutter.
Cyanides and ammonia, method of and apparatus for producing, T. B. Fogarty 500,651
Cycle mud guard, C. E. Hadley 500,889
Cycle pedal, dust proof, A. Perkins 500,942
Cycles, construction of, J. M. & W. Starley 500,971
Dash, carriage, C. A. Behlen 500,999
Dash, vehicle, C. A. Behlen 500,845
Desks, device for operating the slides or rests of, J. B. Pooley 500,610
Disinfecting device, H. L. Bennett 500,734
Disintegrator, M. W. Leonhardt 500,916
Display frame, W. O. Rogers 500,745
Display rack, C. Frankel 500,879
Display stand, M. Anthony 500,839
Doll heads, apparatus for moulding, Vallee & Schultz 500,682
Door, grain, J. Sheridan 500,963
Dough-mixing apparatus, S. L. Hall 500,656
Draft equalizer, G. Jones 500,808
Drapery hook and pin, F. S. McKenney 500,744
Draw-bar attachment, Walker & Bedford 500,728
Drawer slide and extension support, V. R. Harvey 500,575
Dredging apparatus, J. Price, Jr 500,818
Dress shield, H. Moschcowitz 500,928
Dress stiffeners, machine for making, I. D. Warner 500,636
Drier. See Laundry drier.
Drilling machine, multiple, D. E. & L. E. Whiton 500,646
Driving wheel, G. D. Munsing 500,669
Dust, treating flue, M. W. Iles 500,590
Dye, red azo, Green & Lawson 500,761, 500,762
Dye, violet red, L. Lifschutz 500,917
Ear piece, R. Seiffert 500,967
Earthenware, liquid material for the manufacture of fine, J. Klieber 500,585
Educational appliance, J. E. Von Tassel 500,824
Electric currents, meter for alternating pulsating or intermittent, T. Duncan 501,000
Electric ignitor, W. F. West 500,644
Electric machines, brush holder for dynamo, H. G. Reist 500,614
Electric motor, J. MacHaffie 500,663
Electric switch, G. E. Linton 500,918
Electric switch, E. Thomson 500,629
Elevator gate, Lagerquist & Nelson 500,586
Elevator safety device, N. V. Fitts 500,876
Emery wheel, J. R. & A. M. Carpenter 500,561
Engine. See Gas engine. Rotary engine. Steam engine.
Engine reversing gear, Whittington & Fishering 500,985
Engines, combustion chamber for petroleum or hydrocarbon, Richardson & Norris 500,674
Engines, oil-supplying device for hydrocarbon, Richardson & Norris 500,673
Engines, rock arm for horizontal, E. J. Armstrong 500,840
Envelope, J. M. Cutter 500,996
Feed roll, sectional, R. M. Gleason 501,004
Feed water regulator, C. H. Gersting 500,571
Fence post, J. B. Gowdy 500,888
Fence post, C. H. Van Wagoner 500,635
Fertilizer distributer and grain drill, L. I. & J. M. Bodenhamer 500,557
File, paper, W. H. Albee 500,837
Filter and cooler, F. E. Cady 500,737
Fire lighter, automatic, J. L. Cutler 500,995
Fires draw, etc., device for making, C. B. Stuart 500,628
Fireplace frame, H. G. Dawson 500,697
Flood gate, H. H. Eatherton 500,970
Fluid compressor, J. Rebsamen 500,720
Folding chair, coin-freed, J. O. Tonkin 500,783
Frame. See Awning frame. Display frame. Fireplace frame.
Fruit picker, J. Swanburg 501,032
Fuel, artificial, M. Nirdlinger 500,984
Furnace. See Boiler furnace. Heating furnace. Hot-air furnace.
Furnace, J. T. Jenkins 500,905
Furnaces, gas burner for boiler, C. T. Sloan 500,724
Gage. See Metering machine gage.
Game, A. M. Grubbs 500,888
Garbage, disposing of city, H. B. Arnold 501,097
Garment supporter, D. H. Warner 500,637
Gas burner, natural, W. G. Taylor 500,694
Gas burner, self-generating, H. F. Smith 500,969
Gas engine, F. Cordenons 500,754
Gas generator, J. Nolan 500,935
Gases. Apparatus for and process of obtaining combined nitrogen and fuel, T. B. Fogarty 500,650
Gate. See Bridge gate. Flood gate. Elevator gate.
Gate, W. K. Mills 500,593
Generator. See Gas generator. Steam generator.
Glass. See Opera, field, marine, and other glass.
Glass bottles. Finishing tool for, Sheldon & Lynn 500,960
Glass decorating apparatus, J. Macher 501,014
Grain binder, C. Colahan 500,738
Grain binder, G. L. Phelps 500,608
Grain drill, J. A. M. Tyler 500,726
Grain splitting machine, J. Winter 500,729
Gravity helmet, J. F. Corker 500,696
Guard. See Cattle guard. Hatchway guard. Cycle mud guard. Penholder guard.
Guitars. Adjustable tail piece for, F. A. Ingersoll 500,581
Gun. Breechloading, J. Rider 500,949
Gun carriage brake, F. Mohr 500,927
Guns. Hydraulic recoil brake for, A. Kampf 500,908
Hame coupling, A. A. Parsons 500,606
Hammer. Forging, A. Sperl 500,970
Hammock, J. Shinn 500,692
Hand press, W. S. Kisinger 500,660
Harness, L. N. Darr 500,863
Harrow, W. J. Lawrence 501,012
Harvester tension device, T. Sampson 500,778
Hat, I Shepard 500,962
Hat, coat, and umbrella rack, E. W. Trout 500,633
Hatchway guard, C. J. Reynolds 500,721
Hay or hog rack, W. H. Long 500,920
Hay stacker, O. C. Nilson 500,599
Heater. See Water heater.
Heater flue register, W. H. Meyers 501,019
Heating apparatus, G. L. Shorey 500,693
Heating furnace, W. P. Winner 501,034
Heel, M. Murray 500,816
Holdback, G. C. Edmunds 501,005
Hook. See Drapery hook. Whiffletree hook. Lacing hook.
Hoop fastening. Barrel or other, E. W. Beazell 500,844
Horse blanket strap, A. P. Russell 500,619
Horseshoe, D. Gingold 500,881
Horseshoe, Nailless, S. Pruden 500,946
Hose coupling. Electric, J. B. Strauss 500,822
Hot air furnace, C. C. Soffeiss 500,821
Ice boat. Oar-propelled, G. H. Thacher 500,826
Ice machine, G. F. Knox 501,045
Ice shedder or shaver, T. Mabbett 500,928
Induction coil. Coin operated, W. R. Pope 500,776
Injector, F. Brunbauer 500,752
Injector, J. W. Stanley 500,677
Inkstand. Fountain, E. C. Mayloy 500,690
Insulating coupling, L. McCarthy 501,021
Insulator. Conduit railway, G. E. Noyes 500,987
Intersecting miter, M. Gates 500,570
Iron. See Sad iron. Soldering iron.
Jack. See Lifting jack. Wagon jack. Screw jack.
Jewel-setting machine, W. Rundquist 500,954
Journal box, G. W. M. Bowen 500,794
Keyhole guide, C. Taylor 500,977
Knitting machine. Straight, W. T. Rowlett 500,953
Lacing hook, W. B. H. Dowse 500,565
Lamp. Central draught, F. Rhind 501,025
Lamp. Electric arc, R. M. Hunter 500,757
Lamp. Electric arc, W. A. Turbayne 500,829
Lamp. Electric incandescent, Burnett & Doane 500,849
Lamp globe. Incandescent, T. B. Atterbury 500,841
Lamp. Incandescent electric, W. E. Nickerson 500,671
Lamp. Incandescent electric, Nickerson & Cary 500,670
Last, W. Gordon 500,711
Lasting machine, J. T. Avery 500,548
Lathe attachment, J. E. Richards 500,722
Lathe. Metal turning, T. Coldwell 500,755
Laundry drier, A. V. M. Sprague 500,625
Leather skiving machine, A. J. Allen 500,838
Leveler. Land, W. Falconer 500,874
Lifting jack, Mahaffey & Haldeman 500,689
Lightning arrester, W. A. Turbayne 500,828
Lightning arrester, C. S. Van Nuis 500,726
Linoleum or oil floorcloths. Manufacturing, J. C. Lyon 500,812
Liquid goods. Receptacle for carrying, G. Perelli-Minetti 500,773
Liquid storage vessels, device for removing sediment from bottoms of, Harder & Fox 500,742
Lock. See Nut lock. Railway switch lock.
Lock, G. E. Tyson 500,680

© 1893 SCIENTIFIC AMERICAN, INC

Locomotive boiler, W. B. Mack..... 500,716
Locomotive, compound, R. C. Wright..... 500,788
Locomotive, electric, L. W. Case..... 500,851
Locomotives, safety stop for, J. N. Lauder..... 500,810
Loom, D. Durkin..... 501,001
Loom harness, machine for making, E. Haast..... 500,653
Loom Jacquard mechanism, F. Charcot..... 500,852
Loom warp stop motion, J. C. Brooks..... 501,041
Looms, drop box changing mechanism for power, F. Hofmann..... 500,768
Lumber piling machine, H. Daniels..... 500,861
Magazine camera, E. E. Ellis..... 500,707
Magnetic separators, device for and method of adjusting and equalizing the magnetic density in the pole pieces of, C. Q. Payne..... 500,606
Mail, holder for sending coins by, W. B. Coulter. 500,800
Match bunching machine, E. H. Eisenhart..... 500,872
Matte from slag, apparatus for separating, Sheedy & Iles..... 500,621
Meat rack, F. Schraudner..... 500,956
Mechanical movement, E. M. Kellogg..... 500,584
Medical appliance, electro, S. Herthington-Carruthers..... 500,767
Medical purposes, machine for making tablets for, J. J. Mitchell..... 500,594
Metal bar to be calked, W. Grant..... 500,884
Metal working, J. H. Bassler..... 501,038
Meter. See Multiphase meter.
Milker, cow, C. F. Kastengren..... 500,713
Mills, automatic feed regulator for, A. N. Wolf... 500,832
Miter. See Intersecting miter.
Motive power from river currents, apparatus for obtaining, A. A. Raubold..... 500,947
Motor. See Air motor. Electric motor.
Mower, W. R. Baker..... 500,550
Mowing machine cutter bars, mechanism for raising, G. H. Pratt..... 500,945
Multiphase meter, T. Duncan..... 500,868
Music writing machine, F. H. Bowen..... 500,798
Nail cutting machine, W. N. Severance.... 500,958, 500,959
Neckscarf, T. C. Robinson..... 500,622
Needle, sewing, H. A. Blanchard..... 500,556
Nipples during threading, device for holding, J. H. Reilly..... 500,746
Nipples during threading, device for holding, F. W. Smith, Jr..... 500,748
Nut lock, B. Porter..... 500,672
Nut locks, cement for, C. Swayze..... 500,975
Opera, field, marine, or other glass, Aitchison & Bradley..... 500,835
Optical illusion, H. E. Perry..... 500,607
Ore concentrator, J. H. McCoy..... 501,022
Ore or feed pulverizer, J. M. Jones..... 500,582
Ore separator, W. S. Lockhart..... 500,662
Ores separator, magnetic, C. Q. Payne..... 500,605
Ores, method of and apparatus for separating, C. Q. Payne..... 500,604
Oxygen, making, Webb, Jr., & Rayner..... 500,697
Package carrier, J. G. Parkinson..... 501,023
Package carrier apparatus, W. H. Albach..... 501,035
Packing for stuffing boxes, metallic, T. H. Holmes..... 500,899
Pad. See Blotting pad.
Padlock, G. W. Jopson..... 500,907
Paper, machine for cross cutting and collating, Robinson & Chamberlain..... 501,027
Paper, machine for making vegetable parchment, G. T. Leonhard..... 500,915
Paper stock, method of and apparatus for producing, S. W. Rowell..... 500,617
Paper twine, making, J. F. Steward..... 500,627
Pegging machine, T. Gare..... 500,652
Pen, fountain, W. A. Leary..... 500,811
Pen, hog, B. M. Wilkinson..... 500,699
Penholder guard, E. Dierlamm..... 500,564
Pencil sharpener, A. Fornander..... 501,043
Photographic roll holder, X. G. E. de Faucompre 500,875
Piano-agraffe, G. J. Couchois..... 500,562
Picker. See Berry picker. Fruit picker.
Pile or timber protector and preserver, G. E. Surgi..... 500,678
Pile planting, A. Simon..... 500,780
Pin. See Clothes pin.
Pipe. See Supply and waste pipe.
Piperazin, obtaining, W. Marckwald..... 500,665
Planter, corn, C. E. Kessler..... 500,909
Planter, cotton, L. M. Rhodes..... 501,026
Plow, T. W. Boyle..... 500,750
Plow, T. H. Lancaster..... 501,011
Plow, A. S. Seeley..... 500,691
Pocketbook, J. S. Huey..... 500,901
Pole, vehicle, J. H. Osborne..... 500,642
Post. See Fence post.
Power applying mechanism, G. W. and M. G. Gillette..... 500,710
Power transmission, A. L. Ide..... 500,579
Press. See Bending-press. Hand-press, Pressure-regulator, N. Curtis..... 500,994
Printing aniline-black, J. Bracewell..... 500,556
Printing device, Chromatic, T. J. Turley..500,784, 500,785
Printing folded fabrics, &c. Mechanism for, R. J. Linton..... 500,770
Pulley-brake, B. F. Radford..... 500,611
Pump, C. S. Cox..... 500,856
Pump governor, Steam, A. P. Massey..... 501,018
Pump, Steam, W. B. Mason..... 500,590
Punch, Check, M. O. Smith..... 500,676
Puzzle, G. T. and M. H. Bradley..... 500,795
Rack, Se Display-rack. Hay or hog rack. Meat-rack.
Rail-chair, M. Maloney..... 500,589
Railway-crossing, H. Elliott..... 500,706
Railway-frog, I. B. West..... 501,033
Railway, Overhead electric, J. C. Henry..... 501,009
Railway-rail, E. R. Esmond..... 500,688
Railway-rail brake, S. M. J. House..... 501,010
Railway-rail chair, A. J. Moxham..... 500,931
Railway-rail, Compound, J. C. Telfer..... 500,825
Railway signal apparatus, J. C. G. Mugnier..... 500,668
Railway signal system, Thomas & Seward..... 500,827
Railway-switch lock, Automatic, G. Brocke..... 500,796
Railway system, C. Carr..... 500,992
Railway system, Electric, F. S. Perrine..... 500,943
Railway transfer-table, A. J. Moxham..... 500,929
Rake, W. R. Jenkins..... 500,904
Rattan or other stock, Machine for splitting, M. E. Moore..... 500,813
Razor-strop, W. C. Howard..... 500,806
Refrigerator-car, T. B. Roberts..... 500,615
Register. See Cash-register. Heater-flue register.
Regulator. See Feed-water regulator. Pressure-regulator.
Rheostat, E. Thompson..... 500,631
Ring. See Spinning-ring.
Riveting-machine, J. B. Courtet..... 500,755
Riveting-machine gauge, E. Easton..... 500,869
Rotary engine, W. W. Andrews..... 500,988
Rule, Pocket, R. J. Gilham..... 500,572
Sad-iron, H. Clayton..... 500,854
Saddle, Harness, J. H. Price..... 501,024
Sash-balance, R. R. Cowl..... 500,736
Sash-balance, J. H. Shipman..... 500,967
Sash-cord fastener, L. Gerhardt..... 500,760
Saws, Work-guide for, V. Stein..... 500,973
Scow, Dumping, B. A. Mullin..... 501,020
Screw-jack, Cox & Fahey..... 500,757
Seal, E. J. Brooks..... 501,042
Seal, J. L. Hayden..... 500,743
Sealing bottles, jars, &c. Means for hermetically, A. Weissenthanner..... 500,698
Seaming machine, Sheet metal, Hosmer & Wilson..... 500,900
Seat. See Vehicle spring-seat.
Secondary-battery, W. L. Silvey..... 500,622
Secondary electric battery, Theryc & Obiasser.... 500,978
Seesaw and merry-go-round, Combination, F. Goldsmith..... 501,005
Separator. See Cream-separator. Ore-separator.
Sewing-machine, Buttonhole, W. F. Fair..... 500,708
Shirt and collar therefor, B. Lowenberg..... 500,922
Shoe, B. R. Tilligren..... 500,680
Sleeve, Separator, C. Kind..... 500,714
Signaling system, W. E. Decrow..... 500,563
Sirup-dispensing apparatus, H. Hoff..... 500,897
Soap, Soft, D. Allen..... 501,036
Soldering-iron and heater, Electric, A. Tinnerholm..... 500,681
Sorting materials according to size, Machine for, W. S. Lockhart..... 500,771
Spark arrester and ejector, Combined, T. E. Austin..... 500,648
Spindle. See Spinning and doubling spindle.
Spinning and doubling spindle, Crabtree & Gillow 500,857
Spinning-machine attachment, L. Croes *et al*..... 500,758
Spinning-ring, G. O. Draper..... 500,999
Spout for metallic vessels, Separable, C. I. McLaughlin..... 500,933
Spring support, Elliptic, W. S. Noyes..... 500,600
Sprinkler. See Street-sprinkler.
Square, T. A. Walentowitz..... 500,727
Stand. See Display-stand.
Stapling-machine, G. Hay..... 500,576
Stave-dressing machine, D. F. Miller..... 500,666
Steam-boiler, F. M. Ashley..... 500,733
Steam engine, R. D Werden..... 500,749
Steam generator, Finlayson & Popkins..... 500,803
Steam generator and smelting furnace, J. L. Giroux..... 500,886
Steelhardening apparatus, E. Tweedy..... 500,979
Stocking and knitting same, J. H. Woodward..... 500,700
Stone saw, D. C. Miller..... 500,592
Store service apparatus, H. M. Weaver..... 500,641
Stove, P. Frank..... 500,878
Stove, Alcohol, J. Heller..... 500,765
Stove, Cooking, T. Fuller..... 500,599
Stove, Gasoline or vapor, H. Ruppel..... 500,747
Stove, Oil, I. Block..... 500,745
Stove, Oil heating, C. Brandt..... 500,751
Stovepipe fastener, E. W. Mohroff..... 500,667
Stoves or soldering apparatus, Burner for cooking, J. V. Svenson..... 500,781
Strap. See Horseblanket strap.
Street sprinkler, C. A. Clark..... 500,853
Street sweeper brush, Jones & Gillies..... 500,906
Supply and waste pipe, W. A. Eberhart..... 500,871
Switch. See Electric switch.
Switch piece and making it, A. J. Moxham..... 500,930
Table. See Railway transfer table.
Telephone system, G. L. Anders..... 500,545
Thill coupling, J. W. Hoddinott..... 500,885
Thrasher and binder combined, A. L. Gill..... 500,709
Ticket stamping and cutting machine, R. Busek. 500,797
Tiles, Frame for illuminating, H. Haustein..... 501,008
Tinning machine, Norton & Hodgson..... 500,718
Tire, Pneumatic, R. W. Huss..... 500,658
Tire, Pneumatic, G. Pickel..... 500,944
Tire, Pneumatic, C. F. Warner..... 500,639
Tobacco stripping and booking machine, J. R. Williams..... 500,647
Tool, Combination, J. D. Barnett..... 500,551
Tool holder, F. E. Youngs..... 500,834
Toy, C. S. Edwards..... 500,567
Toy bank, R. A. Breul..... 500,848
Toy vehicle, F. H. Harris..... 500,805
Track cleaner, G. W. Ruggles..... 501,028
Track sanding device, A. & E. C. Goldsmith..... 500,882
Traction wheel, A. G. Rose..... 500,819
Truck, Hand, G. Lillie..... 500,661
Truck, Lumber, H. Daniels..... 500,860, 500,862
Trunks, hat boxes, etc. Manufacture of, H. Krammer..... 500,912
Truss, W. Danz..... 500,739
Tubing, Flexible metallic, W. H. K. Bowley..... 500,847
Tubing, Steam gauge, C. A. G. Winther..... 500,830
Tubular frame construction, A. Perkins..... 500,911
Turkish bath, Chiffonier, A. J. Cross..... 500,858
Turn buckle, W. H. Albach..... 500,836
Type wheels, Die for making, F. Ecaubert..... 500,801
Type writing machine, W. Clark..... 500,798
Valve, Automatic relief, W. F. West..... 500,645
Valve operating device for gas heaters, A. T. Welch..... 500,643
Valve, Relief, A. L. Harrison..... 500,891
Vegetable chopper, C. B. Trumble..... 500,695
Vehicle running gear, J. Urbanek..... 500,960
Vehicle spring seat, J. A. Alexander..... 500,789
Vehicle wheel, M. Burgess..... 500,703
Vehicles, Driving mechanism for road, A. C. Ames..... 500,544
Veil clasp, C. M. Day..... 500,864
Velocipede, Ice, A. Karlson..... 500,583
Velocipede, Ice, D. Smith..... 500,623
Ventilator. See Apartment ventilator.
Veterinary operating table, W. J. Magee..... 500,588
Vote counting apparatus, E. G. Richards..... 500,948
Wagon jack, Z. L. Palmer..... 500,940
Wagon or cart, Read & Hager..... 500,612
Wall facing, D. F. Saum..... 501,029
Warp threads, Harness supporting and heddle eye selecting device for machines for drawing in, L. P. Sherman..... 500,965
Warp threads, Needle operating and reed dent separating device for machines for drawing in, L. P. Sherman..... 500,964
Warp threads, Thread selecting device for machines for drawing in, L. P. Sherman..... 500,966
Watch bow fastener, L. Platnauer..... 500,817
Water, Apparatus for sterilizing, D. Grove..... 500,763
Water carrier, Highland, Northway & Hammond 500,936
Water conductors to buildings, Device for attaching, O. Rosenquest..... 500,616
Water cooler, E. T. Green..... 501,007
Water cruet, Eucharistic, L. C. Baudet..... 500,843
Water heater, J. Winterflood..... 500,957
Water heater, Fireplace, A. Berghold..... 500,554
Waterproof fabrics, Manufacturing, G. C. Mandleberg..... 500,664
Washing machine, A. P. Anderson..... 500,546
Weather strip, M. Bradford..... 500,559
Weather strip, H. C. Fuller..... 500,759
Weather strip, Green & Wesselowski..... 500,685
Weed cutter, etc., W. A. McCoy..... 500,932
Welding machine, electric, M. M. Suppes..... 500,973
Wheel. See Driving wheel. Emery wheel. Traction wheel. Vehicle wheel.
Wheel, F. C. Hockensmith..... 500,578
Wheel, H. E. Kuhner..... 500,913
Whiffletree hook, G. C. Edmunds..... 501,002
Windmill, W. Kouns..... 500,911
Windows, metallic setting for stained glass, G. B. Lee..... 500,587
Wood embossing machine, S. L. Davis..... 500,998
Wood moulding machine, H. P. Anderson..... 500,790
Wrench and wheel fitter combined, J. Robertson. 500,800
Wringer. See Clothes wringer.
Yarn drying machine, Tymeson & Ducros..... 500,634

TRADE MARKS.

Baking powder, W. F. McLaughlin..... 23,294
Beer, lager, Henn & Gabler Brewing Company.... 23,303
Bicycles and tricycles and parts thereof, Black Manufacturing Company..... 23,324
Bitters, emulsions, cough mixtures, sarsaparilla, and remedy for rheumatism, C. H. Smith..... 23,314
Butterine, Swift & Company..... 23,280
Candles, certain, Phoenix Candle Company..... 23,288
Capsules, antiseptic uterine lotion, and laxative tablets, vaginal, J. A. Miller..... 23,318
Cigarette paper, Abadie & Company..... 23,306
Cigarettes and tobacco, National Cigarette and Tobacco Company..... 23,307
Collyrium employed as a remedy for the eyes, R. Hudnut..... 23,310
Dress trimmings, Dreyfuss & Toff..... 23,282
Flour, wheat, Northwestern Consolidated Milling Company..... 23,296 to 23,302
Flour, wheat, W. H. Stokes..... 23,295
Hams and pork meat, Edward Heitzeberg Packing and Provision Company..... 23,292
Hardware, including locks and latches, builders', Reading Hardware Company..... 23,325
Herrings and sardines, Yzermans & Co..... 23,298
Hot air and water heaters, Richardson & Boynton Company..... 23,323
Insect exterminating compound, Watson, Erwin & Co..... 23,320
Lard and butter, substitute for, Armour & Co.... 23,291
Matches, Oshkosh Match Works..... 23,287
Medicines and pills, liver and kidney, Lincoln Pill Company..... 23,316
Mirrors, plate glass, R. A. Schlegel & Bro..... 23,321
Oils, lubricating, Abbott Cylinder Oil Company.. 23,289
Perfumery, C. L. Cotton..... 23,285,
Perfumery, toilet soaps and cosmetics, Blondeau et Cie..... 23,283, 23,284
Perfumers, toilet soaps and cosmetics, Blondeau et Cie..... 23,284
Pianos, McCammon Piano Company..... 23,322
Remedies for coughs and colds, H. H. Stoddard.. 23,311
Remedies for gonorrhea, gleet, etc., Pease & Johnston..... 23,317
Remedies for coughs, colds, catarrh, etc., sirup, M. P. Hahn..... 23,312
Remedy for kidney and liver complaints, Herbaline Medicine Co..... 23,315
Remedy for rheumatism, G. A. Lehnau..... 23,313
Remedy for the tobacco habit, U. Stackhouse.... 23,309
Salve, M. P. Hahn..... 23,319
Tobacco and cigarettes, plug or chewing, twist, and smoking, J. B. Pace Tobacco Company.... 23,308
Whisky, Culbert & Co..... 23,304
Whisky, E. Elsing & Co..... 23,305

DESIGNS.

Billiard table, P. Auganbraum..... 22,594
Bottle stopper, J. Cave..... 22,582
Bracket, E. C. Hiscock..... 22,586
Cabinet, M. J. Cantwell..... 22,588
Cigar head former, C. Hvass..... 22,595
Counter wall fixture, B. F. Cahn..... 22,589,
Counter wall fixture, W. C. Huss..... 22,591
Cup, W. A. Brown..... 22,580
Easel, V. Adler..... 22,587
Gimp, C. Weinberg..... 22,579
Glass vessel, J. J. O'Connor..... 22,581
Monument, W. H. Perry..... 22,593
Rug, A. Petzold..... 22,578
Ruler, P. Cox..... 22,583,
Sign, C. W. Spalding..... 22,585
Stove, oil, J. Kells..... 22,592

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Patent Foot Power Machinery
Complete Outfits.

Wood or Metal workers without steam power can successfully compete with the large shops, by using our New LABOR SAVING Machinery, latest and most improved for practical Shop Use, also for Industrial Schools, Home Training, etc. Catalogue free.
Seneca Falls Mfg. Co.
695 Water Street, Seneca Falls N. Y.

WILSON IMPROVED IRON PLANERS.
STANDARD SIZES KEPT IN STOCK. W. A. WILSON RIVER ST. ROCHESTER N.Y.

IMPROVED ENGINE LATHES MODERN DESIGNS
Also Foot Lathes, Tools and Supplies. Catalogue Free
Sebastian Lathe Co. 120-122 Culvert Street CINCINNATI, OHIO.

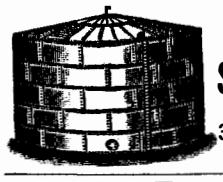
New Full Mounted Lightning Screw Plate.
Send for Catalogue.

Wiley & Russell Mfg. Co., Greenfield, Mass., U.S.A.

Rubber Rolls and Wheels.
Power Wringing Machines, Drying and Ventilating Fans. All styles of Trucks made to order. Catalogues free. GEORGE P. CLARK, Box I., Windsor Locks, Conn.

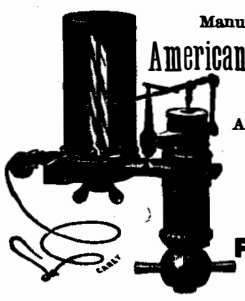
MASON & HAMLIN SCREW STRINGER
One of the greatest improvements in the history of the Piano Forte.
Keeps the Piano in Tune. Much More Durable. Quality of Tone Purer.
☞ *Fully Illustrated Catalogue sent on application.*
Mason & Hamlin Organ & Piano Co.
152 TREMONT ST., BOSTON, MASS.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 59. Price 10 cents. To be had at this office and from all newsdealers.

WM. GRAVER TANK WORKS,
(INCORPORATED.)

Manufacturers of Iron and Steel
STORAGE TANKS.
OFFICE, 3d Floor, Rookery Bldg.
CHICAGO, ILL.

To Inventors.
E. Konigslow, manufacturer of Fine Machinery and Models, offers Special Facilities to Inventors. Guarantees to work out ideas in strictest secrecy, and *any improvement that he can suggest goes with the work.* Thousands of men have crude though really valuable ideas, which they lack mechanical training to develop. Novelties and patented articles manufactured by contract. 181 Seneca St., Cleveland, Ohio.

PRINT YOUR OWN CARDS
PRESS, $3
Larger size, for circulars, $8.
Small newspaper press, $44.
Money saver or money making business. Full printed instructions. Send stamp for catalogue of presses, type, paper, etc. KELSEY & CO., Mfrs., Meriden, Conn.

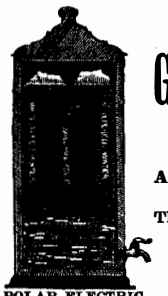
THOMPSON IMPROVED INDICATOR
Manufactured solely by

American Steam Gauge Co.
5,000 IN USE.
Adopted by the U. S. Navy on all the government cruisers and gunboats to be built.
Also Manufacturers of
POP SAFETY VALVES,
STEAM PRESSURE GAUGES, ETC.
34 Chardon Street, Boston, Mass.

SMOKELESS POWDER AND MAGAZINE RIFLES.—By L. G. Duff Grant. An interesting paper on the various smokeless powders for military purposes now in existence, and the weapons mostly used therewith. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 892 and 893. Price 10 cents each. To be had at this office and from all newsdealers.

A NEW CAMERA THE PREMO
Fitted with all improvements for hand or tripod work, including swing-back and adjusting front, yet withal
EXCEEDINGLY COMPACT.
It is the ideal Camera for Tourists, Bicyclists, Canoeists, and all others to whom a saving in space is an important consideration.
Full particulars in our new catalogue—mailed free.
ROCHESTER OPTICAL CO.
14 So. Water St., ROCHESTER, N. Y.

FREE ON APPLICATION
BABCOCK & WILCOX Co
WATER TUBE
30 CORTLANDT ST. N.Y.
107 HOPE ST GLASGOW, SCOTLAND
STEAM BOILERS
MANUFACTORIES IN UNITED STATES, SCOTLAND, FRANCE, GERMANY & AUSTRIA

LIFE SAVING DEVICES.—A COLlection of suggestions of devices for communicating between the shore and stranded vessels, offered to the London *Daily Graphic* by various correspondents. With 100 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 848, 849, 850, 851, 852, 854, 861, 862, 864, 869, 871, 874 and 884. Price 10 cents each, or $1.30 for the series. To be had at this office and from all newsdealers.


The McCONNELL Germ Proof Filters
REMOVE MICROBES
—AND—
All Kinds of Disease Germs.
Is a Filter and Cooler Combined.
The ice as it melts is filtered.
No other gravity filter does this.
The McConnell Filter Co.
POLAR ELECTRIC. BUFFALO, N. Y.

THE SCIENTIFIC AMERICAN
☞ ESTABLISHED 1845.
The Most Popular Scientific Paper in the World
Only $3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's **risk.** Address all letters and make all orders, drafts, etc., payable to
MUNN & CO., 361 Broadway, New York.

THE
Scientific American Supplement
This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages **full of** engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States, Canada, and Mexico, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check.
MUNN & CO., 361 Broadway, New York,

Building Edition.
THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interestin examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

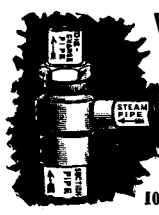
The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to
MUNN & CO., Publishers,
361 Broadway, New York.

© 1893 SCIENTIFIC AMERICAN, INC

Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.

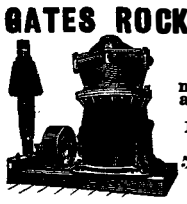
☞ Our new and Revised Catalogue of Practical and Scientific Books, 88 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.



VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
—10 SIZES.—
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE VANDUZEN & TIFT CO.,
102 to 108 E. Second St., Cincinnati, O.

IF YOU HAVE ANY SMALL ARTICLES in Brass or Iron that you want manufactured in quantities, write to THE JONES BROS. ELECTRIC CO., 28–30–32 West Court St., Cin'ti, O.

GATES ROCK & ORE BREAKER



Capacity up to 200 tons per hour.
Has produced more ballast, road metal, and broken more ore than all other Breaks combined.
Builders of High Grade Mining Machinery. Send for Catalogues.
GATES IRON WORKS,
50 C So. Clinton St., Chicago
136 C, Liberty Street, New York,
237 C, Franklin St., Boston, Mass

Visitors to the WORLD'S FAIR

should inspect the handsome Registers, Sunshine Recorders, Anemometers, and other Meteorological apparatus on exhibit in Weather Bureau Building, from Julien P. Friez, 107 E. Ger. St., Baltimore, Md., U. S. A., who also manufactures Heliographs for U. S. Army and State Militias.

Write for Catalogue.

STEEL TYPE FOR TYPEWRITERS

Stencils, Steel Stamps, Rubber and Metal Type Wheels, Dies, etc.
Model and Experimental Work.
Small Machinery, Novelties, etc., manufactured by special contract.
New York Stencil Wks. 100 Nassau St., N. Y

GRAPES: HOW TO KEEP.—METHOD of preserving grapes by the use of bottles of water and by water tubes. With 5 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **890**. Price 10 cents. To be had at this office and from all newsdealers.

WOODEN TANKS FOR RAILROADS WATER WORKS MILLS, FARMS &C
LARGE WATER TANKS A SPECIALTY COMPLETE STOCK OF CYPRESS LUMBER
SPECIFICATIONS FURNISHED FOR FOUNDATIONS & TOWERS
W. E. CALDWELL Co
217 E. MAIN ST. LOUISVILLE KY

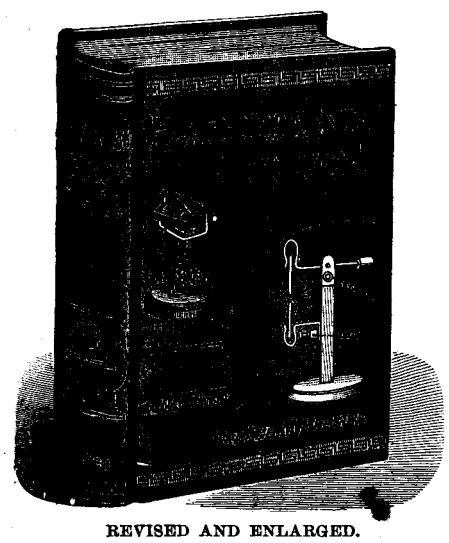
ALUMINUM: ITS USES AND APPLICATIONS. A valuable and interesting article by G. L. Addenbrooke. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **859**. Price 10 cents. To be had at this office and from all newsdealers.

FREE A fine 14k gold plated watch to every reader of this paper. Cut this out and send it to us with your full name and address, and we will send you one of these elegant, richly jeweled, gold finished watches by express for examination, and if you think it is equal in appearance to any $25.00 gold watch, pay our sample price, $3.50, and it is yours. We send with the watch our guarantee that you can return it at any time within one year if not satisfactory, and if you sell or cause the sale of six we will give you ONE FREE. Write at once, as we shall send out samples for 60 days only.
THE NATIONAL M'F'G & IMPORTING CO.,
334 Dearborn St., Chicago, Illinois.

NOW READY!

Fourteenth Edition of

Experimental Science



REVISED AND ENLARGED.
120 Pages and 110 Superb Cuts added.

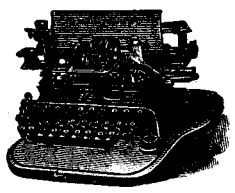
The unprecedented sale of this work shows conclusively that it is the book of the age for teachers, students, experimenters, and all others who desire a general knowledge of Physics or Natural Philosophy.

In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc.; Systems of Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.

860 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, **$4.** Half morocco, **$5.**

☞ *Send for illustrated circular.*

MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN,
361 BROADWAY, NEW YORK.



THE "MUNSON" TYPEWRITER.
This machine is an "evolution," the outgrowth of years of experience and the best results of scientific work. Its principles appeal at once to the educated mechanic. It is Light, Small, Compact, Easily operated, with Universal Key Board.
INTERCHANGEABLE STEEL TYPE WHEEL,
durable and easily kept in order. 30 keys, 90 characters. Weight, with carrying case, 16 pounds. Special wheels for different languages. *Send for circular to*
*** * THE MUNSON TYPEWRITER CO., * ***
162 S. La Salle Street, Chicago, Ill., U. S. A.

EDISON PHONOGRAPHS FOR SALE.
ADDRESS,
North American Phonograph Co.
EDISON BUILDING
New York.
Masonic Temple Bldg.,
Chicago.

WITH YOUR WORKSHOP EQUIPPED
With outfits of Barnes Wood and Metal Working Machinery you can successfully compete with Factories that use steam power, both in quality and profit on product. The only complete line of such machines made. Have stood the test twenty years. Send for catalogue. Address:
W. F. & JOHN BARNES CO.,
1999 Ruby St., Rockford, Ills.

Inventions and Novelties Developed.
Manufacturers of Electrical Goods. Experimental and Repair Work. THE N. Y. ELECTRICAL AND DEVELOPMENT CO., 251 William Street, New York.

Has no equal for all machinery bearings. It is used where no other known metal will stand.
THEO. HIERTZ & SON, Manufacturers Babbitt Metals Solder, Stereotype and Electrotype Metals, Lead Car Seals, etc., 2935 W. Park Avenue, ST. LOUIS, MO.

THE SIMPLEX TYPEWRITER

GUARANTEED to do as good work as any high priced machine. Specially adapted for use in private correspondence. Sent by mail or express prepaid on receipt of $2.70. *See Sci. Am.*, Oct. 1, p. 211.
Address Simplex Typewriter Co., 32 Great Jones Street, New York.

$20 to $60 Saved on New BICYCLES
A $39 Victor Jr. for $18. All makes new & 2d hand; largest & oldest dealers in U.S. *Easy Paym'nts if desired.* We sell everywhere. Cata. free.
Rouse, Hazard & Co.,
Mfrs. 16 G st., PEORIA, ILL.

LIQUID FUEL FOR STEAM MAKING.—By F. R. Hutton. A paper pointing out the advantages of partially refined and crude petroleum for boiler firing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **896**. Price 10 cents. To be had at this office and from all newsdealers.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
THOMAS DEVLIN & CO.
LEHIGH AVE. & AMERICAN ST. PHILA.

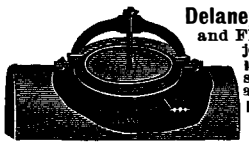
PROPOSALS.

SEALED TENDERS WILL BE RECEIVED BY the Government of Newfoundland, addressed to the Colonial Secretary, on or before the 15th day of August next, for a lease of the St. John's First Class Simpson's Improved Dry Dock, and of the harbor works in connection therewith, for a term of ten, fifteen or twenty years. The Dry Dock is 620 feet in extreme length, with a draft of 25 feet of water on the sill at high tide. It is built of concrete, pitch pine and oak, and is in good condition. The property is equipped on one side of the dock with all necessary repair, shop and office accommodation, in a brick building 400 feet long, 30 feet wide and 16 feet height of wall. The shop is provided with 1 vertical drill, 1 punch and shears, 1 set plate rolls, electric light plant, and engine and boiler, with necessary shafting. In separate brick building, on the same side of the dock, is the pumping installation, consisting of two W. H. Allan's 30-inch centrifugal pumps (direct acting horizontal engines) and one 10-inch centrifugal (engine, compound, double, vertical), all supplied by a pair of marine boilers. The gate is a floating iron caisson, provided with steam warping capstan and steam ballast pump. Tenders must state term of years proposed, rent and securities for performance of contract. Further particulars may be had on application to me. R. BOND, Colonial Secretary, St. John's, Newfoundland.—25th May, 1893.

After being on the Market Seven Years
THE ACME AUTOMATIC ENGINE AND BOILER
STILL LEADS!
Half to Four Horse Power. Marine and Stationary.
For either Natural Gas or Petroleum as Fuel.
☞ **NO EXTRA INSURANCE.**
Acme Automatic Safety Engine.—"Stationary." Oil Tank. ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y.

HARRISON CONVEYOR!
For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars. | BORDEN, SELLECK & CO., { Sole Manu'fers. } Chicago, Ill.

VOLNEY W. MASON & CO.
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

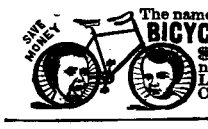


Delaney's Metallic Gaskets and Flanges make everlasting joints. **Delaney's Expansion Packings** for steam, water and ammonia are best and cheapest.
H. J. Delaney & Co., Third & Fowler Sts. Milwaukee, Wis.

Industries-Patents-Capital-Skilled workmen
We locate industries, organize new companies, sell patents, procure capital, find the right place for skilled workmen and partners. Suburbs and towns needing industries should write us.
FINLEY'S INDUSTRIAL BUREAU, Zanesville, Ohio.

AGENTS $50 to $100 —A— WEEK.
Ladies or Gents. Best seller known. Needed at every house, place of business or farm the year round. "Home" Electric Motor runs all kinds of light machinery. Cheapest power on earth. Connected instantly to wash or sewing machine, corn sheller, pumps, fans, lathes, jeweler's or dentist's machinery, &c. Clean, Noiseless, lasts a life-time. No experience needed. To-show in operation means a sale. Guaranteed. Profits immense. Circulars free.
W. P. HARRISON & CO., Columbus, O

INVENTORS and Experimentors can obtain valuable assistance from us in perfecting their ideas. Models and patterns a specialty. Write us. WM. GARDAM & SON 98 John St., New York.



The name to remember when buying a **BICYCLE** is A. W. GUMP & CO., DAYTON, OHIO. **$30 to $50 saved** on many new and second-hand Bicycles. Lists free. Over **2000** in stock. Cash or time. **Agents wanted.**

WE SEND FREE
with this beautiful **Organ an Instruction Book** and a handsome, upholstered **Stool!** The organ has 11 stops, 5 octaves, and is made of Solid Walnut. Warranted by us for 15 years. We only charge **$45** for this beautiful instrument. Send to-day for **FREE** illustrated catalogue. **OXFORD MFG. CO Chicago.**

PATTERN MAKER, H. VAN SANDS, 144 Centre St., N. Y.

DRILL CHUCKS. Write "THE PRATT CHUCK CO.," Clayville, N. Y., U. S. A., for free illustrated catalogue of **POSITIVE DRIVING DRILL CHUCKS**, showing the only perfect system ever devised for holding and driving drills.
Foreign Agencies: Ph. Roux et Cie., 54 Boulevard du Temple, Paris, France. E. Sonnenthal, Jr., Nueu Promenade No. 5. Berlin, Germany. Selig, Sonnenthal & Co., 85 Queen Victoria Street, London, E. C., England.

CELLULOID ZAPON Co. MANUFACTURERS OF CELLULOID LACQUERS
41 BARCLAY ST. NEW YORK.

Model & Experimental Work
Small Articles Manufactured in Quantities.
Inventions perfected and developed. Working in Aluminum a specialty. S. P. Denison, Designer and Builder of Fine Machinery, 143 Centre St., New York.

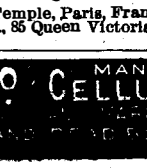
Astronomical Telescopes

of superior defining power,
Photographic Lenses, etc.
Manufactured by
W. & D. MOGEY,
Bayonne, New Jersey.
☞ Send for new catalogue.

FRUIT EVAPORATOR
"The Granger." For family use. *Cheapest in the market.* $3.50, $6 & $10. Circular
Eastern Mfg. Co., 259 South 5th St., Phila., Pa.

Dust! Dust!
Gibbs' Patent Dust Protector protects the nose and mouth from inhaling poisonous dust. Invaluable in every industry where dust is troublesome. Nickel plated protector $1.00 postpaid in U. S. or Canada; $1.40 to foreign points. *Circulars free.* GIBBS RESPIRATOR CO., 31 La Salle St., Chicago.

EXPERT MODEL MAKING, Established 1867.
J. C. SEYL, Prop. Chicago Model Works, Chicago, Ill. 179 E. Madison St. Write for Catalogue of Model Supplies.



OSGOOD'S DEAF ORAPHONE.
An instrument that will positively assist the deaf. Easily carried in pocket. Made of bell metal. Will last for years. $3.00 in stamps or P. O. Order. Reference Union National Bank.
OSGOOD BROS., Oakland, Cal.

New Books

The American Ready Reckoner. A new and complete assistant for merchants, mechanics and farmers. For the purpose of showing at a glance the amount and value of any quantity of merchandise, from a quarter of a cent to ten dollars, either by weight or measure. 192 pages. Pocket size..... **25**

Alternating Currents of Electricity; their generation, measurement, distribution and application. By Gisbert Kapp. One vol, cloth. 166 pages. 1893...**$1.00**

Asphalt. Twenty years' practical experience of natural asphalt and mineral bitumen. By W. H. Delano. One vol. 73 pages. Illustrated. 1893..... **50**

Design. Practical Designing. A handbook on the preparation of working drawings. Edited by Gleeson White. Elegantly bound in cloth. 12mo. 327 pages. Profusely illustrated. 1893.....**$2.50**

Dictionary, Standard Electrical. By Prof. T. O'Conor Sloane. 12mo, cloth. 624 pages. 350 illustrations. 1892.....**$3.00**

A new dictionary of terms in electrical science and allied branches. The definitions cover the meaning and scope of terms, the electrical constants of all conductors and dielectrics, wire gauge tables and elaborately revised or newly calculated tables of equivalents. The work aims to be the most complete and reliable ever published. Synonyms are given after each title. Cross references are freely used. The work really constitutes a cyclopedia of the science, and is an invaluable addition to even the smallest of electrical libraries.

Drawing. A manual of machine drawing and design. By D. A. Low and A. W. Beers. 375 pages. Illustrated. 1893.....**$2.50**

Dyeing. A manual of dyeing; for the use of practical dyers, manufacturers, students, and all interested in the art of dyeing. By Edmund Knecht, Christopher Rawson and Richard Lowenthal. With numerous illustrations and specimens of dyed fabrics. 3 vols. 8vo, cloth. 1893.....**$15.00**

The Dynamo. Its theory, design and manufacture. By C. C. Hawkins and F. Wallis. With 190 illustrations. 520 pages. 1 vol, cloth. 1893.....**$3.00**

Dynamo. How to manage the dynamo. A handbook for ship engineers, electric light engineers and electroplaters. By S. R. Bottone. 12mo, cloth. 63 pages. 1893..... **60**

Electricity and Magnetism. A popular introduction. By S. R. Bottone. 1 vol, 12mo. 203 pages. Illustrated. London, 1893..... **75**

Forest Planting. A treatise on the care of timber lands and the restoration of denuded woodlands on plains and mountains. By H. N. Jarchow. Illustrated. 12 mo, cloth. 237 pages. 1893.....**$1.50**

Foundations. A practical treatise on foundations, explaining fully the principles involved. By W. M. Patton. One vol, 8vo. 402 pages. 22 folding plates. 1893.....**$5.00**

Irrigation. Manual of irrigation engineering. By Herbert M. Wilson. One vol. 8vo, cloth. 351 pages. Illustrated. 1893.....**$4.00**

Lime. A manual on lime and cement, their treatment and use in construction. By A. H. Heath. One vol. 12mo, cloth. 215 pages. 1893.....**$2.50**

Liquors and Preserves. The manufacture of. Translated from the French of J. DeBrevans. With 65 illustrations. 19 tables. 200 pages. 12mo, cloth. 1893.....**$3.00**

Locomotive Catechism. Containing nearly 1,300 questions and answers concerning designing and constructing, repairing and running various kinds of locomotive engines. Intended as examination questions and to post and remind the engine runner, fireman, or learner. By Robert Grimshaw. One vol. cloth. 362 pages. 178 illustrations. Containing also full description, with large folding plate, of the famous engine No. 999, recently built and operated by the N. Y. C. & H. R. R. R. 7 folding plates. 1893.....**$2.00**

Metal-Plate Work. Its patterns and their geometry; also notes on metals and rules in mensuration. By C. T. Millis. Second edition enlarged. 377 pages. 1893.....**$3.50**

Municipal Improvements. A manual of the methods, utility and cost of public improvements, for the municipal officer. By W. P. Goodhue. 12mo, cloth. 1893.....**$1.50**

Needlework. A text-book of needlework, knitting and cutting out, with methods of teaching. By Elizabeth Rosevear. With original illustrations and sectional diagrams. 460 pages. 1893.....**$1.75**

Photography. Practical pocket-book of photography. A short guide to the practice of all the usual photographic processes for professionals and amateurs. By Dr. E. Vogel. Translated by E. C. Conrad, F.C.S., from the second German edition. With many illustrations and a copious index. 202 pages. Cloth.....**$1.00**

Public Health. A treatise on public health and its application in different European countries. By Albert Palmberg and Arthur Newsholme. One vol. 8vo, cloth. 182 illustrations. 539 pages. 1893.....**$5.00**

Pumping Machinery. A practical handbook relating to the construction and management of steam and power pumping machines. By W. M. Barr. With upward of 260 engravings, covering every essential detail in pump construction. 447 pages. Cloth. 1893.**$5.00**

Rocks Classified and Described. A treatise on lithology. By Bernhard von Cotta, with English, German and French synonyms. Translated by P. H. Lawrence. One vol. 8vo, cloth. 430 pages. 1893.....**$4.50**

Soap Manufacture. A practical treatise on the fabrication of hard and soft soaps, and analytical methods for the determination of their chemical composition. By W. L. Gadd. One vol, cloth. 224 pages. Illustrated. 1893.....**$1.50**

Sound and Music. By Rev. J. A. Zahm, C.S.C., Professor of Physics in the University of Notre Dame. 452 pages. Illustrated. 1892.....**$3.50**

Star Maps and Luminous Stars. A method for quickly learning the names and positions of the constellations, the movements of the planets, etc. By R. A. Proctor and A. E. Beach. One quarto vol. cloth. 1893.....**$2.50**

Street Railway Motors. With descriptions and cost of plants, and operation of the various systems in use or proposed for motive power on street railways. By Herman Haupt. One vol. cloth. 213 pages. 1893.....**$1.75**

Telephone Lines and their Properties. By Wm. J. Hopkins. 258 pages. Illustrated. London. 1893.....**$1.50**

The Great Barrier Reef of Australia; Its Products and Potentialities. Containing an account, with copious Colored and Photographic Illustrations (the latter here produced for the first time), of the Coral and Coral Reefs, Pearl and Pearl-Shell, Bêche-de-Mer, other Fishing Industries, and the Marine Fauna of the Australian Great Barrier Region. By W. Saville Kent. 16 Chromo plates and 48 plates in Photomezzotype. Super-Royal 4to. Cloth. London, 1893..**$30.00**

Telegraphic Connections. Embracing recent methods in Quadruplex Telegraphy. By Charles Thorn and Willis H. Jones. One oblong volume. Cloth. 50 pages, 20 plates, colored.....**$1.50**

FREE.

Our entirely new Catalogue of Scientific and Technical Books, containing over 3,000 titles, and embracing more than 300 different subjects, with Authors' Index, will be mailed free on application to any address in the world. Address

MUNN & CO.,
Publishers of the "Scientific American,"
361 Broadway, New York.

© 1893 SCIENTIFIC AMERICAN, INC

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - - $1.00 a line

☞ *For some classes of Advertisements, Special and Higher rates are required.*

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

COLD FORGED PRODUCT.

Forged Wood Screw

Patented May 10, July 19, 1887; Oct 29, 1889; Aug. 19, Oct. 21, 1890; April 7 May 12, 1891; July 19, 1892.

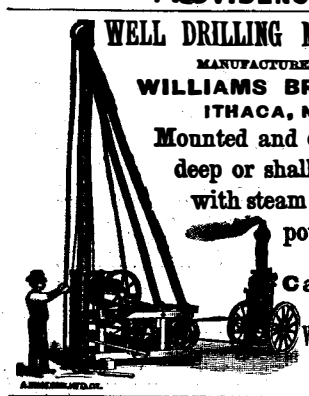
Its Advantages are:

1. Stronger than a common screw.
2. Uniform and wide slot.
3. Requires the use of but one bit in hard wood.
4. Inserted easier.
5. Centralized point.
6. Superior holding power.
7. The screw being **Cold Forged**, instead of **Cut**, leaves on its entire surface a metallic skin.

☞ Send for samples to

AMERICAN SCREW CO.
PROVIDENCE, R. I.

WELL DRILLING MACHINERY,
MANUFACTURED BY
WILLIAMS BROTHERS,
ITHACA, N. Y.,



Mounted and on Sills, for deep or shallow wells, with steam or horse power.

Send for Catalogue.

ADDRESS
Williams Brothers
ITHACA, N. Y.

ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

A GENTLEMAN'S LAUNCH

YOUR OWN ENGINEER.
Launches 19 to 60 feet in length, with automatic machinery. No Smoke. No Engineer. No Danger. No Dirt.

PADDLE YOUR OWN CANOE.
Canoes, Family Row and Sail Boats. Fishing and Hunting Boats. Manufactured by
THOMAS KANE & CO., Chicago, Ill.
☞ Send for catalogue specifying line desired.

Contentment

is folly when you might do better.

What is the mat er with your time? A trifle fast? A little slow? Always a few minutes wrong?—Does your watch cost more to carry than it did to buy it? Repairs, regulating, cleaning; a dollar or two every time you bump it? You might save it over and over in a year; show just as much style and always be on time, too, with the new, **quick-winding** Waterbury.

Every jeweler keeps it. A jeweled watch. All styles for everybody. $4 to $15 buys it. Ladies', gentlemen's or boy's watch; cased in nickel, coin-silver or filled gold (10 to 14-karat).

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

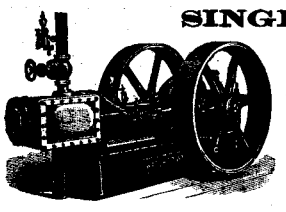
In this line of business they have had *forty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

BRANCH OFFICES.—Nos. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.



SINGLE CYLINDER AND COMPOUND
HIGH SPEED
ENGINES
Watertown Steam Engine Co.
WATERTOWN, N. Y.

SEND FOR OUR CIRCULAR.
IN ONE MINUTE
IT WILL CONVINCE YOU OF OUR ABILITY TO SUPPLY TOILET PAPER FOR LESS MONEY THAN IT CAN BE OBTAINED ELSEWHERE. **A.P.W. PAPER Co.** ALBANY, N.Y.

KODAKS.

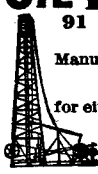
Take one with You.
to the World's Fair.

They're the only practical camera for the purpose. No bulky glass plates—no troublesome holders—no need of hunting up a dark room. With our special Columbian spools of film, containing 200 exposures you can have your Kodak loaded before leaving home and can then "*press the button*" as often as you like, while at the Fair without the necessity of reloading.

Eastman Kodak Co.,
{ Send for Catalogue. } Rochester, N. Y.

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

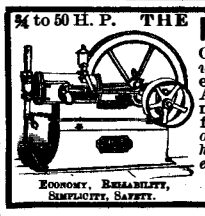
OIL WELL SUPPLY CO.



91 & 92 WATER STREET, PITTSBURG, PA.
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests
Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. *Illustrated catalogue, price lists, and discount sheets on request.*

AGENTS WANTED WRITE FOR CATALOGUE AND AGENCY. **FOR FINE TOOLS IN EVERY SHOP.**
C. H. BESLY & CO.
CHICAGO, ILL. U.S.A.

¼ to 50 H. P. **THE**



ECONOMY, RELIABILITY, SIMPLICITY, SAFETY.

Motor of 19th Century

Can be used *any place*, to do *any work*, and by *any one*. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A perfectly safe Motor for all places and purposes. *Cost of operation about one cent an hour to each indicated horse power.* For circulars, etc., address
CHARTER GAS ENGINE CO.
P. O. Box 148. Sterling, Ill.

ELECTRIC SUPPLIES

MOTORS, and DYNAMOS,
from 1-6 h. p. to 15 h. p.
Bells, Annunciators, Batteries, etc. No Toys, but Standard Goods. *Complete illustrated catalogue sent on receipt of 20c. postage.*
The Holtzer-Cabot Electric Co
84 Franklin St., BOSTON, MASS.

ZINC ETCHING
HALFTONE PROCESS

Printer Engravings

OF MAGAZINES, BOOKS, SOUVENIRS.

CATALOGUE WORK A SPECIALTY

A. H. KELLOGG
SCOTT & BOWNE BUILDING New York.

"IMPROVEMENT THE ORDER OF THE AGE."

The Smith Premier Typewriter

Embodies the most Progressive Mechanical Principles.
All the Essential Features Greatly Perfected.
Perfect and Permanent Alignment.
Easiest Running, and Nearly Silent.
All type cleaned in Ten Seconds without Soiling the Hands.
The Smith Premier Typewriter Co., Syracuse, N. Y., U. S. A.
We have 20 branch offices in the principal cities throughout the United States.

Send for Catalogue.

ASTRONOMY

Poole Bros. Celestial Planisphere and Celestial Handbook just published.
For descriptive circular address
POOLE BROS., CHICAGO, ILL.

Parsons Horological Institute.

Learn the Watch Trade

Engraving and Jewelry Work.

PARSONS, IDE & CO. ☞ *Circular free.*
302 Bradley Ave., PEORIA, ILL.

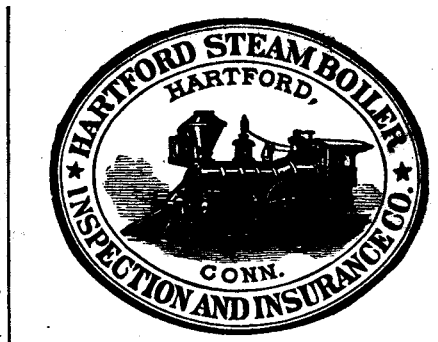
"OTTO"

GAS AND GASOLINE ENGINES.

½ to 100 h. p. Can be used in cities or in country independent of gas works or gas machines.

No Boiler, No Danger, No Engineer.

OVER **30,000 SOLD.**
OTTO GAS ENGINE WORKS, PHILADELPHIA.



THE LIQUEFACTION OF AIR.—A lecture delivered by Prof. James Dewar before the Royal Institution on the production of liquid common air in bulk. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **896.** Price 10 cents. To be had at this office and from all newsdealers.

DESIGNING AND BUILDING OF NEW MACHINERY.
SUPPLY AND INSTALLATION OF STEAM ENGINES, PUMPS, ELECTRIC PLANTS.

COMPLETE ELECTRICAL EQUIPMENTS

—FOR—

ARC OR INCANDESCENT LIGHTING.

Arc Lamps. Incandescent Lamps. House Wiring Appliances.

MINIATURE ·· LAMPS ·· FOR ·· DECORATIVE ·· PURPOSES.

GENERAL ELECTRIC COMPANY,

DISTRICT OFFICES:

44 Broad Street.....New York.	620 Atlantic Avenue.....Boston, Mass.
173 and 175 Adams Street.....Chicago, Ill.	429 Arch Street.....Philadelphia, Pa.
Fifth and Race Streets.....Cincinnati, O.	401-407 Sibley Street.....St. Paul, Minn.
Equitable Building.....Atlanta, Ga.	1519 F Street, N. W.....Washington, D. C.
15 First Street.....San Francisco, Cal.	Masonic Temple.....Denver, Colo.

All business outside the U. S. transacted by Thomson-Houston International Electric Co. 44 Broad St. New York

---

ENGINES, BOILERS & MACHINE TOOLS. Complete outfits furnished. *Send for prices and 300 p. catalogue.* W. P. DAVIS, Rochester, N. Y.

"The ease of cycling is in the tire."

Columbia Bicycles are fitted with the

COLUMBIA PNEUMATIC TIRE

The Columbia catalogue is the most readable book of its class—beautifully illustrated—Free at Columbia agencies — by mail for two 2-cent stamps.

Guaranteed against puncture.
Fastest and most resilient.
Built to last.

POPE MFG. CO.,
Boston. New York. Chicago. Hartford.

PATENT JACKET KETTLES

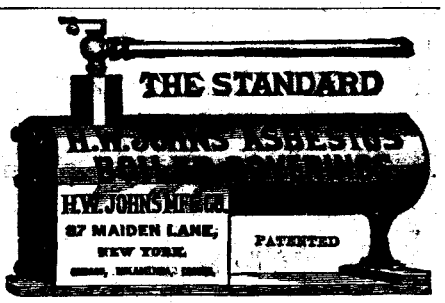
Plain or Porcelain Lined.
Tested to 100 lb. pressure. Send for Lists.
BARROWS-SAVERY CO.,
S. Front & Reed Streets, Philadelphia, Pa.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, including works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., Publishers Scientific American,
361 Broadway, New York.



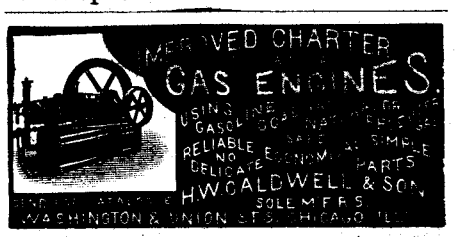
The American Bell Telephone Company

125 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent No. 186,787, granted to Alexander Graham Bell, January 30, 1877, the scope of which has been defined by the Supreme Court of the United States in the following terms:

"The patent itself is for the mechanical structure of an electric telephone to be used to produce the electrical action on which the first patent rests. The third claim is for the use in such instruments of a diaphragm, made of a plate of iron or steel, or other material capable of inductive action; the fifth, of a permanent magnet constructed as described, with a coil upon the end or ends nearest the plate; the sixth, of a sounding box as described; the seventh, of a speaking or hearing tube as described for conveying the sounds; and the eighth, of a permanent magnet and plate combined. The claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."

This Company also owns Letters Patent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.



PRINTING INKS.

The SCIENTIFIC AMERICAN is printed with CHAS. ENU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

© 1893 SCIENTIFIC AMERICAN, INC